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PEDCo Environmental, Inc.
Cincinnati, OH

Prepared for

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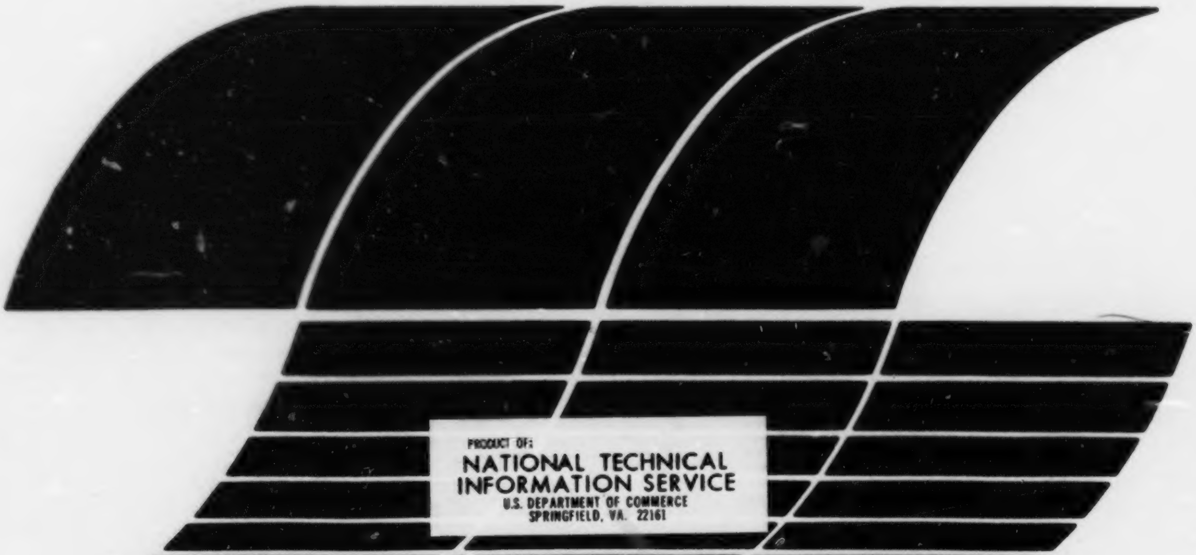

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16. ABSTRACT

This report is the first full compilation (not a supplement) since the October-December 1979 report (EPA-600/7-80-029a). Because the next three reports are to be supplements, this issue should be retained for reference throughout the year. The report, which is generated by a computerized data base system, presents a survey of operational and planned domestic utility flue gas desulfurization (FGD) systems, terminated domestic utility FGD systems, operational domestic particle scrubbers, and Japanese coal-fired utility boiler FGD installations. It summarizes information contributed by the utility industry, process suppliers, regulatory agencies, and consulting engineering firms. Domestic FGD systems are tabulated alphabetically by development status (operational, under construction, or in planning stages), utility company, process supplier, process, and waste disposal practice. It presents data on boiler design, FGD system design, fuel characteristics, and actual performance. It includes unit by unit dependability parameters and discusses problems and solutions associated with the boilers and FGD systems. Process flow diagrams and FGD system economic data are appended. **Section 3 of this report, because of its length, appears in Volume II (EPA-600/7-81-012b).**

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Desulfurization		Utility Boilers	07A, 07D
Electric Utilities			
Waste Disposal			15E
Boilers			13A

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by

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Washington, DC 20460

i.a

NOTICE

This report (prepared by PEDCo Environmental, Inc., Cincinnati, Ohio under EPA Contract No. 68-02-3173, Task No. 17) is provided as an information transfer document. Data in this report are supplied voluntarily by utility representatives; flue gas desulfurization (FGD) system designers and suppliers; regulatory personnel; and others. Neither EPA nor the designated contractor warrants the accuracy or completeness of information contained in this report.

Initial distribution of the report (generally one copy per company) is limited to organizations and individuals indicating a specific interest in the field of FGD technology. Additional copies of this report and preceding issues can be purchased from National Technical Information Service, Springfield, Virginia 22151.

This report presents a summary of the FGD system design and performance data stored in the Flue Gas Desulfurization Information System (FGDIS), a computerized data base from which it is generated. Plans are currently being formulated to allow access to the FGDIS by private users (subject to the limitations expressed in the first paragraph above). It is anticipated that this will be implemented during the first or second quarter, 1981, at which time the service will be available to the public through the National Technical Information Service for a usage charge (non-profit). Users will have the capability to access the additional design and performance data stored within the data base that cannot be conveniently printed in this report. Direct access to the data base will allow statistical analyses of the data (e.g., averages, maxima, minima, and standard deviation of various parameters) and tabulation of the data to fit the individual informational needs of the user. When this service becomes available, the current recipients of this report will be notified; and classes will be provided on the use of the system.

USE OF THIS REPORT

This report is the first full compilation (not a supplement) since the October-December 1979 report (EPA-600/7-80-029a). Because the next three reports are to be supplements, this issue should be retained for reference throughout the year. Much of the design and performance data contained in this issue will not be published again until February 1982. Supplemental issues are cumulative in nature, so that it is necessary only to retain the latest issue and this report to have all the available information.

It should be noted that along with the design and performance data for operational FGD systems contained in Section 3, this report also contains a number of tables presenting tabulations of some of the key data. The Executive Summary contains the number and capacity of FGD systems as of the end of December 1980, future projections (December 1990) of controlled and uncontrolled generating capacity, and unit by unit summaries of status changes and performance during the period.

Appended to this report is a section containing reported and adjusted cost data for U.S. FGD systems in which operational systems are stressed (Appendix A). Also included in the appendices are definitions, a table of unit notation, and FGD process flow diagrams.

ABSTRACT

This report, which is generated by a computerized data base system, presents a survey of operational and planned domestic utility flue gas desulfurization (FGD) systems, operational domestic particle scrubbers, and Japanese coal-fired utility boiler FGD installations. It summarizes information contributed by the utility industry, system and equipment suppliers, system designers, research organizations, and regulatory agencies. It presents data on system design, fuel characteristics, operating history and actual performance. Unit by unit dependability parameters are included and problems and solutions associated with the boilers, scrubbers, and FGD systems are discussed.

The domestic FGD systems are tabulated alphabetically by development status (operational, under construction, or in the planning stages), utility company, system supplier, process, waste disposal practice, and regulatory class. FGD system economic data, definitions, and a glossary of terms are appended to the report. Current data for domestic FGD systems show 84 systems in operation, 34 systems under construction, and 105 planned systems. Projected 1990 FGD controlled capacity in the U.S. is 106,846 MW.

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EXECUTIVE SUMMARY

This report is prepared quarterly (every three months) by PEDCo Environmental, Inc., under contract to the Industrial Environmental Research Laboratory/Research Triangle Park and the Stationary Source Enforcement Division of the U.S. Environmental Protection Agency. It is generated by a computerized data base system, the structure of which is illustrated in Figure 1.

Table I summarizes the status of FGD systems in the United States at the end of December 1980. Table II lists the units that have changed status during the fourth quarter 1980, and Table III shows the performance of operating units during this period.

TABLE I. NUMBER AND TOTAL CAPACITY OF FGD SYSTEMS

Status	No. of units	Total controlled capacity, MW*	Equivalent scrubbed capacity, MW[†]
Operational	84	31,109	28,214
Under construction	34	14,888	14,285
Planned:			
Contract awarded	30	14,903	14,890
Letter of intent	10	7,515	7,515
Requesting/evaluating bids	16	8,735	8,735
Considering only FGD systems	49	29,696	29,360
TOTAL	223	106,846	102,999

* Total Controlled Capacity (TCC) is the summation of the gross unit capacities (MW) brought into compliance with FGD systems regardless of the percent of the flue gas scrubbed by the FGD system(s).

[†] Equivalent Scrubbed Capacity (ESC) is the summation of the effective scrubbed flue gas in equivalent MW based on the percent of flue gas scrubbed by the FGD system(s).

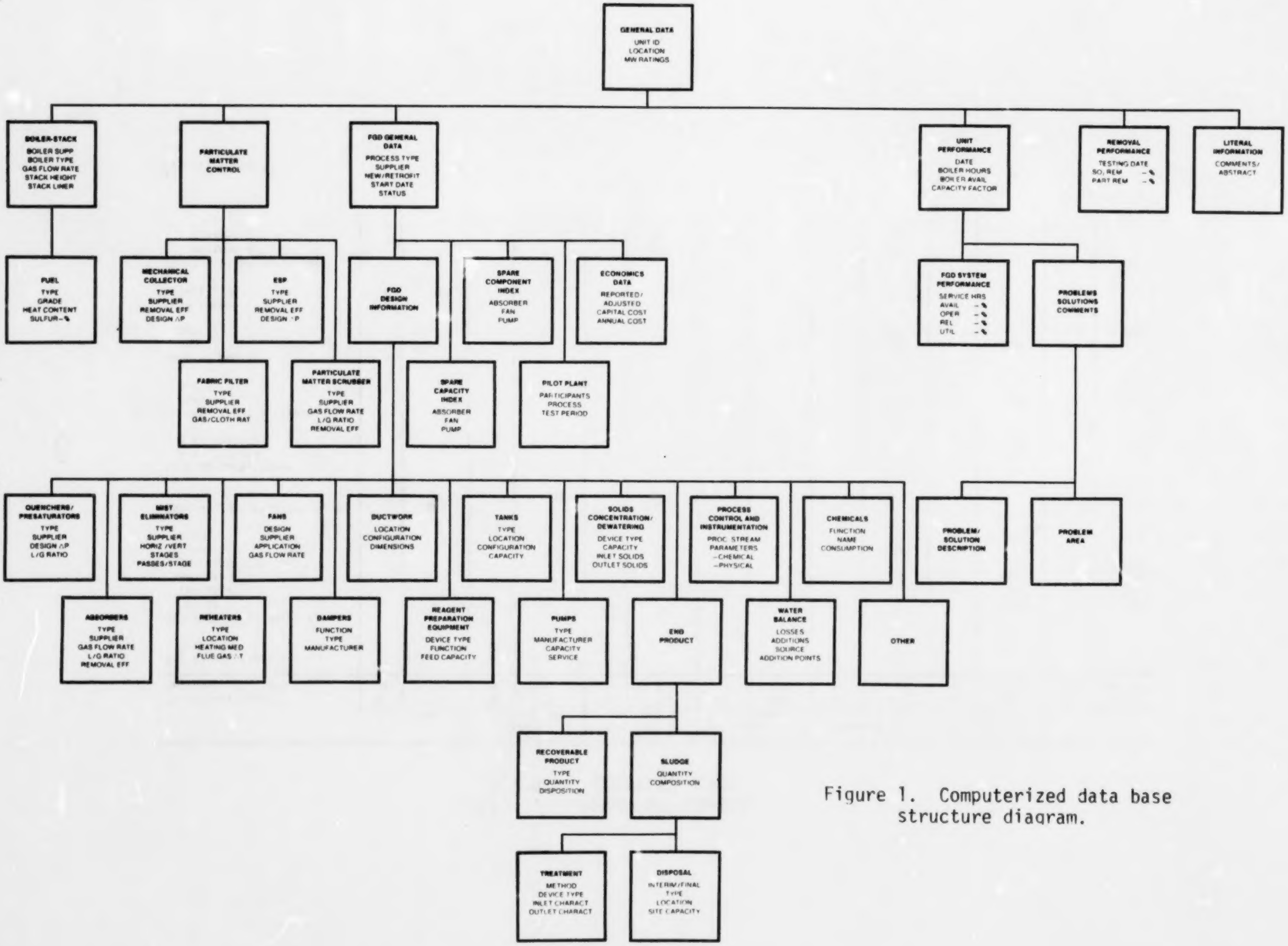
GENERAL DATA
UNIT ID
LOCATION
MW RATINGS
BOILER-STACK
BOILER SUPP
BOILER TYPE
GAS FLOW RATE
STACK HEIGHT
STACK LINER
PARTICULATE MATTER CONTROL
FGD GENERAL DATA
PROCESS TYPE
SUPPLIER
NEW/RETROFIT
START DATE
STATUS
UNIT PERFORMANCE
DATE
BOILER HOURS
BOILER AVAIL
CAPACITY FACTOR
REMOVAL PERFORMANCE
TESTING DATE
SO2 REM —%
PART REM —%
LITERAL INFORMATION
COMMENTS/ ABSTRACT
FUEL
TYPE
GRADE
HEAT CONTENT
SULFUR—%
MECHANICAL COLLECTOR
TYPE
SUPPLIER
REMOVAL EFF
DESIGN ΔP
ESP
TYPE
SUPPLIER
REMOVAL EFF
DESIGN ΔP
FGD DESIGN INFORMATION
SPARE COMPONENT INDEX
ABSORBER
FAN
PUMP
ECONOMICS DATA
REPORTED/ ADJUSTED
CAPITAL COST
ANNUAL COST
FGD SYSTEM PERFORMANCE
SERVICE HRS
AVAIL —%
OPER —%
REL —%
UTIL —%
PROBLEMS SOLUTIONS COMMENTS
FABRIC FILTER
TYPE
SUPPLIER
REMOVAL EFF
GAS/CLOTH RAT
PARTICULATE MATTER SCRUBBER
TYPE
SUPPLIER
GAS FLOW RATE
L/G RATIO
REMOVAL EFF
SPARE CAPACITY INDEX
ABSORBER
FAN
PUMP
PILOT PLANT
PARTICIPANTS
PROCESS
TEST PERIOD
QUENCHERS/ PRESATURATORS
TYPE
SUPPLIER
DESIGN ΔP
L/G RATIO
MIST ELIMINATORS
TYPE
SUPPLIER
HORIZ /VERT
STAGES
PASSES/STAGE
FANS
DESIGN
SUPPLIER
APPLICATION
GAS FLOW RATE
DUCTWORK
LOCATION
CONFIGURATION
DIMENSIONS
TANKS
TYPE
LOCATION
CONFIGURATION
CAPACITY
SOLIDS CONCENTRATION/ DEWATERING
DEVICE TYPE
CAPACITY
INLET SOLIDS
OUTLET SOLIDS
PROCESS CONTROL AND INSTRUMENTATION
PROC. STREAM PARAMETERS
—CHEMICAL
—PHYSICAL
CHEMICALS
FUNCTION
NAME
CONSUMPTION
PROBLEM/ SOLUTION DESCRIPTION
PROBLEM AREA
ABSORBERS
TYPE
SUPPLIER
GAS FLOW RATE
L/G RATIO
REMOVAL EFF
REHEATERS
TYPE
LOCATION
HEATING MED
FLUE GAS ΔT
DAMPERS
FUNCTION
TYPE
MANUFACTURER
REAGENT PREPARATION EQUIPMENT
DEVICE TYPE
FUNCTION
FEED CAPACITY
PUMPS
TYPE
MANUFACTURER
CAPACITY
SERVICE
END PRODUCT
WATER BALANCE
LOSSES
ADDITIONS
SOURCE
ADDITION POINTS
OTHER
RECOVERABLE PRODUCT
TYPE
QUANTITY
DISPOSITION
SLUDGE
QUANTITY
COMPOSITION
TREATMENT
METHOD
DEVICE TYPE
INLET CHARACT
OUTLET CHARACT
DISPOSAL
INTERIM/FINAL
TYPE
LOCATION
SITE CAPACITY

Figure 1. Computerized data base structure diagram.

TABLE II. SUMMARY OF CHANGES
OCTOBER - DECEMBER 1980

FGD status report	Operational		Under construction		Contract awarded		Letter of intent		Requesting/ eval. bids		Considering FGD		Total	
	No.	MW[a]	No.	MW[a]	No.	MW[a]	No.	MW[a]	No.	MW[a]	No.	MW[a]	No.	MW[a]
September 30, 1980	76	25,832	39	16,442	30	14,164	7	5,590	18	9,696[b]	38	23,000	208	94,724[b]
Big Rivers Electric														
Green 2	+1	242	-1	242										
Cajun Electric Power Coop														
Chicot 1											+1	540	+1	540
Chicot 2											+1	540	+1	540
Chicot 3											+1	540	+1	540
Chicot 4											+1	540	+1	540
Oxbow 1									+1	540	-1	540		
Oxbow 2											+1	540	+1	540
Colorado Ute Electric Assn.														
Craig 1	+1	447	-1	447										
East Kentucky Power Coop														
J.K. Smith 1							+1	650			-1	650		
J.K. Smith 2							+1	650			-1	650		
Florida Power & Light														
Martin 3											+1	800	+1	800
Martin 4											+1	800	+1	800
General Public														
Coal 1									+1	625	-1	625		
Coho 1									-1	690			-1	690
Gulf Power														
Scholz 1	+1	20											+1	20
Houston Lighting & Power														
Limestone 1					+1	750			-1	750				
Limestone 2					+1	750			-1	750				

(continued)

TABLE II (continued)

FGD status report September 30, 1980	Operational		Under construction		Contract awarded		Letter of intent		Requesting/ eval. bids		Considering FGD		Total	
	No. 76	MW^a 25,832	No. 39	MW^a 16,442	No. 30	MW^a 14,164	No. 7	MW^a 5,590	No. 18	MW^a 9,696^b	No. 38	MW^a 23,000	No. 208	MW^a 94,724^b
Kentucky Utilities														
Hancock 1											+1	650	+1	650
Hancock 2											+1	650	+1	650
Louisville Gas & Electric														
Mill Creek 1	+1	358	-1	358										
Lower Colorado River Authority														
Fayette Pwr Project 3											+1	435	+1	435
Marquette Board of Light & Pwr														
Shiras 3					+1	31			-1	31				
Michigan So. Central Pwr Agency														
Project 1			+1	55	-1	55								
Monongahela Power														
Pleasants 2	+1	618	-1	618										
New York State Electric & Gas														
Somerset 1							+1	625	-1	625				
Northern States Power														
Metro coal 1											+1	200	+1	200
Riverside 6, 7	+1	110	-1	110										
Sherburne 3											+1	850	+1	850
Wisconsin coal 1											+1	670	+1	670
Philadelphia Electric														
Cromby 1			+1	150	-1	150								
Soyland Power Coop														
Soyland 1											+1	500	+1	500

(continued)

TABLE II (continued)

FGD status report September 30, 1980	Operational		Under construction		Contract awarded		Letter of intent		Requesting/ eval. bids		Considering FGD		Total	
	No. 76	MW[a] 25,832	No. 39	MW[a] 16,442	No. 30	MW[a] 14,164	No. 7	MW[a] 5,590	No. 18	MW[a] 9,696[b]	No. 38	MW[a] 23,000	No. 208	MW[a] 94,724[b]
Springfield Water, Light & Pwr Dallman 3	+1	205	-1	205										
Tennessee Valley Authority Johnsonville 1-10					-1	600							-1	600
Texas Power & Light Sandow 4	+1	382	-1	382										
Washington Water Power Creston Coal 1											+1	570	+1	570
West Texas Utilities Oklaunion 1									+1	720	-1	720		
Oklaunion 2											+1	720	+1	720
Total	84	28,214	34	14,285	30	14,890	10	7,515	16	8,735	49	29,360	223	102,999

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[a] Equivalent scrubbed capacity.

[b] This value was modified slightly due to a MW correction.

TABLE III. PERFORMANCE OF OPERATIONAL UNITS
OCTOBER - DECEMBER 1980

Plant	FGD system capacity, MW[a]	Flue gas % scrubbed	FGD capacity on line during period, MW[a,b]	No information for this period, MW[a]	Shut down throughout period, MW[a]	October 1980 Dependability %[c,e]				November 1980 Dependability %[c,e]				December 1980 Dependability %[c,e]			
						AVL	OPR	REL	UTL	AVL	OPR	REL	UTL	AVL	OPR	REL	UTL
Tombigbee 2	179	70	179			50	0		0	50	37	37	8	81	77	77	73
Tombigbee 3	179	70	179			97	63	63	63	99	86	86	86	100	77	77	77
Apache 2	98	50	98			93	88	99	82	20	22	40	7	100	100	100	100
Apache 3	98	50	98			76	88	97	68	100	96	96	96	100	99	100	97
Cholla 1	119	100		119													
Cholla 2	264	100		264													
Four Corners 1	175	100		175													
Four Corners 2	175	100		175													
Four Corners 3	229	100		229													
Laramie River 1	570	100	570			100	100	100	96	100	98	100	79	100	100	100	93
Green 1	242	100		242													
Green 2	242	100	242														
Duck Creek 1	416	100	416			73	72	75	72	97	89	99	68	92	91	94	91
Newton 1	617	100	617			76	36	46	16	99	85	100	85	74	70	85	69
Craig 1	447	100	447											63	57	79	55
Craig 2	400	87	400			100	91	95	12	71	74	79	33	52	68	70	51
Conesville 5	411	100	411			91	79	82	77	83	50	52	44	92	88	87	81
Conesville 6	411	100	411			92	80	81	72	99	87	86	52	87	80	80	80
Powerton 51	450	100			450		0		0		0		0		0		0
Coal Creek 1	327	60	327				46		9		43		43		47		46
Coal Creek 2	327	60	327				68		68		61		43		55		54
Delaware City 1	60	100	60			66	66	66	66	94	96	96	94	34	56	56	31
Delaware City 2	60	100	60			60	60	60	60	98	98	98	98	100	100	100	100
Delaware City 3	60	100	60			44	44	44	44	0	0	0	0	82	79	79	79
Elrama 1-4	510	100	510			100	97	100	97	100	99	99	99				
Phillips 1-6	408	100	408			72	70	71	70	85	84	85	84				
Scholz 1	20	N/A[d]	20														76
Petersburg 3	532	100		532													
Hawthorn 3	90	100	90			100	100	100	33	80	100	100	40	58	100	100	25
Hawthorn 4	90	100	90			100	100	100	68	72	100	100	66	92	100	100	59
La Cygne 1	820	100	820			100	0		0	99	87	86	8	99	94	98	65
Jeffrey 1	540	75	540			100	100	100	37	100	100	100	87	100	100	100	99
Jeffrey 2	490	70	490			100	100	100	100	100	100	100	56	100	100	100	63
Lawrence 4	125	100	125			100	100	100	100	100	100	100	90	100	100	100	98
Lawrence 5	420	100	420			100	100	100	65	100	100	100	100	100	100	100	100
Green River 1-3	64	100			64	100			0	100			0	100			0

TABLE III (continued)

Plant	FGD system capacity, MW^a	Flue gas % scrubbed	FGD capacity on line during period, MW^{a,b}	No information for this period, MW^a	Shut down throughout period, MW^a	October 1980 Dependability %^{c,e}				November 1980 Dependability %^{c,e}				December 1980 Dependability %^{c,e}			
						AVL	OPR	REL	UTL	AVL	OPR	REL	UTL	AVL	OPR	REL	UTL
Cane Run 4	188	100	188			100	100	100	82	72	53	53	35	100	100	100	77
Cane Run 5	200	100	200			100	100	100	10	100	100	100	25	100	100	100	100
Cane Run 6	299	100	299			100	100	100	100	85	97	97	55	60	6	6	2
Mill Creek 1	358	100	358											45	99	99	45
Mill Creek 3	442	100	442			100	97	97	97	57	49	49	42	100	100	100	61
Paddy's Run 6	72	100			72	0	0		0	0	0		0	0	0		0
Clay Boswell 4	475	85	475				51	100	37	100	69	100	63	100	88	100	84
Milton R. Young 2	185	42	185			100	85	87	76	100	95	99	91	72	63	67	61
Pleasants 1	618	100	618						0								
Pleasants 2	618	100	618														
Colstrip 1	360	100		360													
Colstrip 2	360	100		360													
Reid Gardner 1	125	100	125			98	98	98	93	100	100	100	36	81	77	75	53
Reid Gardner 2	125	100	125			100	0		0	95	94	92	62	100	99	100	98
Reid Gardner 3	125	100	125			85	84	84	81	95	100	95	95	100	96	100	71
Dean H. Mitchell 11	115	99	115			97	90	90	75	100	94	94	86	93	63	63	50
Riverside 6, 7	110	N/A^d	110														
Sherburne 1	740	100	740			100	100	100	72	100	0		0	100	100	100	81
Sherburne 2	740	100	740			100	100	100	100	100	100	100	100	100	100	100	100
Jim Bridger 4	550	100	550						0					95	77	93	69
Bruce Mansfield 1	917	100	917			98	100		28	100			0	100			0
Bruce Mansfield 2	917	100	917			97	100		90	97	100		83	98	100		68
Bruce Mansfield 3	917	100	917			89	100		74	90	100		63	91	100		68
San Juan 1	361	100	361			51	73	74	51	96	86	96	78	100	90	99	88
San Juan 2	350	100	350			11	25	27	10	82	60	60	38	86	52	100	42
San Juan 3	534	100	534														
Coronado 1	280	80		280													
Coronado 2	280	80		280													
Winyah 2	280	100	280			14	93	93	14	100	100	100	100	99	99	99	99
Winyah 3	280	100	280			92	94	91	90	73	73	73	73	95	97	97	95
R.D. Morrow, Sr. 1	124	62	124			63	94	94	25	25	42	42	11	100	99	99	64
R.D. Morrow, Sr. 2	124	62	124			80	99	99	80	80	95	95	75	50	93	93	50
Marion 4	173	100	173			100	100	100	58	90	0	0	0	80	78	78	72
A.B. Brown 1	265	100	265			99	96	96	96	98	84	85	55	99	96	96	93
Southwest 1	194	100	194			0	0	0	0	0	0	0	0	43	6	8	4

TABLE III (continued)

Plant	FGD system capacity, MW[a]	Flue gas % scrubbed	FGD Capacity on line during period, MW[a,b]	No information for this period, MW[a]	Shut down throughout period, MW[a]	October 1980 Dependability %[c,e]				November 1980 Dependability %[c,e]				December 1980 Dependability %[c,e]			
						AVL	OPR	REL	UTL	AVL	OPR	REL	UTL	AVL	OPR	REL	UTL
Dallman 3	205	100	205														
G.F. Weaton 1	60	N/A[d]	60						38				14				25
Shawnee 10A	10	N/A[d]	10					97	86			98	87				
Shawnee 10B	10	N/A[d]	10					99	88			100	64				
Widows Creek 8	550	100		550													
Sandow 4	382	70	382														
Martin Lake 1	595	75	595														
Martin Lake 2	595	75	595														
Martin Lake 3	595	75	595														
Monticello 3	800	100	800														
Hunter 1	360	90	360				100		97		80		76		97		96
Hunter 2	360	90	360				100		70		100		98		100		100
Huntington 1	366	85	366				100		98		100		100		100		100
TOTAL	28,214		24,062	3,566	586												

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[a] Equivalent scrubbed capacity.

[b] This category includes the flue gas capacity being handled by the FGD system at least part of the time during the report period.

[c] The percent figures listed are average values for all system scrubbing trains during the period.

[d] Flue gas % scrubbed for prototype and demonstration units is not applicable unless the system is designed to bring a unit into compliance th SO_2 emission standard.

[e] Availability, operability, reliability, and utilization as defined in Appendix C of this report.

Current projections indicate that the total power generating capacity of the U.S. electric utility industry will be approximately 833 GW by the end of 1990.[a] (This value reflects the annual loss resulting from the retirement of older units, which is considered to be 0.4 percent of the average generating capacity at the end of each year.[b]) Approximately 370 GW or 44 percent of the 1990 total will come from coal-fired units. The distribution of power generation sources, both present (December 1979) and future (December 1990) is as follows:[a]

	Coal	Nuclear	Oil	Hydro	Gas	Other	GW (total)
December 1979	39%	9%	25%	13%	13%	1%	603
December 1990	44%	14%	20%	11%	10%	1%	833

Based on the known commitments to FGD by utilities as presented in Table I, the percentage of electrical generating capacity controlled by FGD for both the present (December 1980) and the future (December 1990) is as follows:

	Coal-fired generating capacity, %	Total generating capacity, %
December 1980*	13.2	5.2
December 1990	29.2	12.8

In light of the revised New Source Performance Standards, actual FGD control is expected to be greater than what is reflected by the figures above. For example, about 40 to 50 systems representing approximately 20,000 to 25,000 MW of generating capacity presently fall into the uncommitted category. These are systems that cannot be included in the committed group at this time because information regarding their status is not ready for public release.

In an effort to show general FGD usage and projected usage trends, the table below gives a current (December 1980) and a projected (December 1990) breakdown of throwaway product systems versus salable product systems as a percent of the total known commitments to FGD as of the end of the fourth quarter 1980:

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* The number of committed FGD systems is as of December 1980; however, the figure used for the total generating capacity and coal-fired generating capacity is based on the available December 1979 figures.

		Percent of total MW	
		December 1980	December 1990
Throwaway product process			
°Wet systems			
Lime		40.5	21.0
Limestone		45.9	36.5
Dual alkali		4.2	2.0
Sodium carbonate		3.3	3.1
N/A[a]		-	6.5
°Dry systems			
Lime		0.5	2.9
Sodium carbonate		-	0.4
Salable product process			
°Process	°Byproduct		
Aqueous carbonate/ spray drying	Elemental sulfur	-	0.1
Citrate	Elemental sulfur	0.2	0.1
Lime	Gypsum	-	0.1
Limestone	Gypsum	-	0.2
Lime/limestone	Gypsum	-	0.5
Magnesium oxide	Sulfuric acid	-	0.7
Wellman Lord	Sulfuric acid	2.5	1.2
Wellman Lord	Elemental sulfur	2.9	0.7
Process undecided		-	24.0
Total		100.0	100.0

[a] NA - Not available (these systems are committed to a throwaway product process; however, the actual process is unknown at this time).

HIGHLIGHTS: OCTOBER - DECEMBER 1980

The following paragraphs highlight FGD system developments during the fourth quarter 1980.

Alabama Electric Cooperative reported that the Tombigbee 3 FGD system achieved availabilities of 97%, 99%, and 100% for the months of October, November, and December, respectively. The utility reported that no major problems occurred during this period.

The limestone FGD system installed at the Laramie River unit of Basin Electric Power Cooperative achieved 100% availability during the months of October, November, and December. The only problems reported for this period were boiler related.

Big Rivers Electric announced that initial FGD operations at Green 2 commenced in November 1980. The 242 MW (gross) boiler fires bituminous coal with an average sulfur content of 3.75%. The FGD system was supplied by American Air Filter and consists of two lime spray towers designed to remove 90% of the inlet SO_2. The system is preceded by a cold side ESP for primary particulate matter removal. The unit is currently in the start-up phase of operation; compliance testing is scheduled for the week of January 18.

Cajun Electric Power Cooperative announced during November 1980 that bids were being requested for a dry scrubbing process to control SO_2 emissions from Oxbow 1 (formerly Big Cajun III 1). Also included in the bid request is an option for five additional dry scrubbing systems to be installed at the Oxbow 2 and Chicot 1-4 units. Oxbow 2 is to be located next to Oxbow 1 in De Soto Parish, Louisiana. Each Oxbow unit will be rated at 540 MW (gross) and will fire lignite with an average sulfur content of 0.6%. Oxbow 1 is scheduled for operation in 1985. No start up date has been set for Unit 2. The Chicot 1-4 units are planned to be constructed in Shreveport, Louisiana. Each 540 MW (gross) unit will fire lignite with an average sulfur content of 1.7%. The Chicot units are scheduled to commence operations in 1986, 1988, 1992, and 1994, respectively.

Initial FGD operations began at Craig 1 of Colorado Ute Electric during October 1980. The unit is rated at 447 MW (gross) and fires subbituminous coal with an average sulfur content of 0.45%. The FGD system, supplied by Peabody Process Systems, utilizes four magnesium promoted limestone spray towers for 85% SO_2 removal. A hot side ESP precedes the system for primary particulate matter control. The stabilized sludge is disposed of in an off site minefill operation. Some FGD system equipment problems made it necessary to operate the unit at approximately 50 to 60% of capacity during November; however, the problems were corrected and the unit returned to full load during the last week of December.

Duquesne Light reported that the Elrama FGD system achieved 100% availability for the months of October and November, respectively. Some absorber module liner repairs were performed during the two month period but no major problems were encountered. Information for the month of December was not available.

East Kentucky Power Cooperative announced that a letter of intent was signed in April 1980 with Babcock and Wilcox for the installation of wet lime FGD systems to control SO_2 emissions from the J.R. Smith units 1 and 2. The units will be rated at 650 MW (gross) each and will fire bituminous coal with an average sulfur content of 1.5%. The FGD systems are scheduled to commence operations in 1985 and 1987, respectively.

Florida Power and Light announced that FGD has been selected as the SO_2 emission control strategy to be used at the Martin units 3 and 4. Each unit will be rated at 800 MW (gross). Projected start-up is 1987 for unit 3 and 1989 for unit 4.

The dual alkali FGD system originally operated in 1975-1976 at the Scholz station of Gulf Power was reactivated in August 1980 by Combustion Equipment Associates and Arthur D. Little. The system is being utilized for an EPA sponsored test program aimed at determining the feasibility of utilizing limestone rather than lime as the source of calcium for the regeneration reactions. The reactor system configuration was changed to a four stage system with an increased residence time; however, no other major system modifications were required. The system was operated in the limestone mode for approximately 70% of December and exhibited SO_2 removal efficiencies reportedly in excess of 90%.

Houston Lighting and Power announced that a contract was awarded to Combustion Engineering for wet limestone FGD systems to control SO_2 emissions from the new Limestone units 1 and 2. Each unit will be rated at 750 MW (gross) and will fire coal with an average sulfur content of 1.08%. A cold side ESP will be used for primary particulate matter control. Scheduled start-up dates are 1984 and 1985 for units 1 and 2, respectively.

Kansas City Power and Light reported that the limestone FGD systems at the La Cygne generating station achieved availabilities of 100%, 99%, and 99% during October, November, and December, respectively. A fire in the "D" module was the only major problem encountered during the quarter.

The FGD systems at Jeffrey 1 and 2 of Kansas Power and Light achieved 100% availability for the fourth quarter 1980. The limestone systems operated with no major problems being reported during this period.

Kansas Power and Light also reported FGD system availabilities of 100% for the Lawrence 4 and 5 FGD systems during the months of October, November, and December, respectively.

Kentucky Utilities announced plans to construct two new units, Hancock 1 and 2, to be located in Hawsville, Kentucky. The units are to be rated at 708 MW (gross) each and will fire a Western Kentucky coal with an average sulfur content of 3.5%. The utility is considering a wet limestone scrubbing system along with an ESP to control SO_2 and particulate matter emissions. Operations are scheduled to commence in 1988 and 1994 for units 1 and 2, respectively.

Louisville Gas and Electric reported that the lime scrubbing system at the Cane Run 5 unit achieved 100% availability for the months of October, November, and December. No operational problems were reported for this period.

Initial operation of the FGD system at Mill Creek 1 of Louisville Gas and Electric commenced during December 1980. The 358 MW (gross) unit fires pulverized coal with an average sulfur content of 3.75%. The retrofitted wet lime scrubbing process was supplied by Combustion Engineering and is designed to remove 85% of the inlet SO_2.

Lower Colorado River Authority has announced plans to construct Fayette Power Project 3 in La Grange, Texas. The 435 MW (gross) unit will fire lignite with an average sulfur content of 1.7%. SO_2 emissions from this unit will be controlled by a FGD system designed for 90% SO_2 removal efficiency. The system is scheduled to commence operation in 1988.

Marquette Board of Light and Power announced that a contract has been awarded to Buell Division, Envirotech for a lime/spray drying system to be installed on the Shiras 3 unit. The system will include a fabric filter that will serve the dual function of primary particulate matter control and spent reagent collection. Initial FGD operations are scheduled to begin in October 1982.

Michigan South Central Power Agency announced that construction on the Project 1 FGD system began in November 1980. This 55 MW (gross) unit is being constructed in Litchfield, Michigan, and will burn coal with an average sulfur content of 2.25%. The wet limestone FGD system is being supplied by Babcock and Wilcox and is expected to begin operation in June 1982.

FGD operations began during October 1980 at the Pleasants 2 unit of Monongahela Power. This unit, which is rated at 618 MW (gross) fires bituminous coal with an average sulfur content of 4.5%. The lime FGD system was supplied by Babcock and Wilcox and consists of four spray tower absorbers. For primary particulate matter removal, an ESP precedes the FGD system. No initial start-up problems were reported to have been encountered during the October through December period.

Reid Gardner 2 of Nevada Power achieved availabilities of 100%, 95%, and 100% for the months of October, November, and December, respectively. No major problems were reported during this period.

New York State Electric and Gas announced that a letter of intent was signed with Peabody Process Systems for a wet limestone FGD system to be installed on the Somerset 1 unit. The system, which will be preceded by a cold side ESP for primary particulate matter control, will be designed for 90% SO_2 removal. Initial start-up of the system is expected in 1984.

Northern Indiana Public Service reported that the Dean H. Mitchell 11 Wellman Lord FGD system achieved availabilities of 97%, 100%, and 93% for the October, November, and December period, respectively. Minor problems were encountered with the SO_2 reduction unit; however, no major problems were reported.

Northern States Power has announced plans to construct Metro Coal 1. This 200 MW (gross) unit will fire a Montana coal with an average sulfur content of approximately 1%. The utility is considering a lime/spray drying process for SO_2 emission control. The expected start up is in 1990.

Initial operation of the demonstration lime/spray drying FGD system installed at the Riverside station of Northern States Power began during November 1980. The 110 MW (gross) system, which was supplied by Joy Manufacturing/Niro Atomizer, consists of a spray dryer followed by a baghouse. The spent absorbent is disposed of in both on and off site landfills. The system operated in a shakedown/debugging phase during November and December.

Northern States Power reported that the limestone/alkaline flyash systems installed at Sherburne 1 and 2 achieved 100% availabilities for the fourth quarter 1980. Unit 1 was out of service in November due to an annual boiler/turbine inspection.

Northern States Power has reaffirmed plans for a third unit, Sherburne 3, to be located along with units 1 and 2 in Becker, Minnesota. Current plans call for joint ownership of the facility with the Southern Minnesota Municipal Power Agency and the United Minnesota Municipal Power Agency. The 850 MW (gross unit will fire a Montana coal with a sulfur content of approximately 1%. The unit will utilize a lime/spray drying process for control of SO_2 emissions and is scheduled to start operations in 1985.

Northern States Power also announced plans to construct a unit, Wisconsin Coal 1, to be located in Durand, Wisconsin. The unit will be rated at 670 MW (gross) and will fire coal with a sulfur content of approximately 1%. The utility is considering controlling SO_2 emissions from this unit by utilizing a lime/spray drying process. The unit is scheduled to commence operations in 1991.

Philadelphia Electric announced that construction began in September 1980 on the retrofit magnesium oxide FGD system being supplied by United Engineers for the Cromby 1 unit. The 150 MW (gross) unit fires coal with an average sulfur content of 3.0%. Start-up of the FGD system is expected in May 1983.

The dual alkali scrubbing system at the A.B. Brown 1 station of Southern Indiana Gas and Electric achieved availabilities of 99%, 98%, and 99% during October, November, and December, respectively. Other than some recurring water balance problems, no major problems were reported for the three month period.

Soyland Power Cooperative has announced plans to construct Soyland 1 in Illinois. The 500 MW (gross) unit will fire an Illinois coal with an average sulfur content of 3.0%. The utility is currently considering FGD as a SO_2 control strategy. Operations are scheduled to commence in 1987.

Initial FGD operations began at Dallman 3 of Springfield Water, Light, and Power in October 1980. The unit is rated at 205 MW (gross) and fires coal with an average sulfur content of 3.3%. The limestone FGD system is preceded by a hot side ESP and includes one horizontal chevron mist eliminator per module. The sludge is trucked off site to a landfill. No major initial start-up problems were reported.

Tennessee Valley Authority has announced that low sulfur coal will be burned at the Johnsonville 1-10 units. As a result, plans for the installation of a magnesium oxide FGD system have been cancelled.

Texas Power and Light announced that initial FGD operations at the Sandow 4 unit began in December 1980. The 545 MW (gross) unit fires lignite with an average sulfur content of 1.6%. The three limestone spray towers supplied by Combustion Engineering will be designed for a SO_2 removal efficiency of 75%. Primary particulate matter removal is provided by a cold side ESP. The system operated in a shakedown mode through the end of December.

Washington Water Power has announced plans to construct Creston Coal 1 in Creston, Washington. The 570 MW (gross) unit is the first of four coal fired units planned for this site. The utility is considering a wet limestone scrubbing system for SO_2 emission control. Construction at this site is scheduled to commence in 1983 with initial operations expected to begin in 1987.

West Texas Utilities has announced that bids are being requested for a FGD system to be installed at the Oklaunion 1 unit. The 720 MW (gross) unit is to be located in Oklaunion, Texas and will fire a subbituminous Wyoming coal with an average sulfur content of 0.34%. The system will operate with a closed water loop. Initial operations are scheduled for 1986.

West Texas Utilities also announced plans to construct a second unit, Oklaunion 2. This unit will be similar in design to Unit 1 with startup expected in 1990.

REFERENCES

a. U.S. Department of Energy. Energy Information Administration. Office of Coal and Electric Power Statistics. Electric Power Statistics Division. Inventory of Power Plants in the United States, December 1979. Publ. No. DOE/EIA-0095 (79).

b. Rittenhouse, R.C. New Generating Capacity: When, Where, and by Whom. Power Engineering 82(4):57. April 1978.

SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
ALABAMA ELECTRIC COOP						
TOMBIGBEE	2	LEROY	ALABAMA	9/78	1	B
TOMBIGBEE	3	LEROY	ALABAMA	6/79	1	B
ARIZONA ELECTRIC POWER COOP						
APACHE	2	COCHISE	ARIZONA	8/78	1	D
APACHE	3	COCHISE	ARIZONA	6/79	1	D
ARIZONA PUBLIC SERVICE						
CHOLLA	1	JOSEPH CITY	ARIZONA	10/73	1	C
CHOLLA	2	JOSEPH CITY	ARIZONA	4/78	1	C
CHOLLA	4	JOSEPH CITY	ARIZONA	2/81	2	C
FOUR CORNERS	1	FARMINGTON	NEW MEXICO	11/79	1	C
FOUR CORNERS	2	FARMINGTON	NEW MEXICO	11/79	1	C
FOUR CORNERS	3	FARMINGTON	NEW MEXICO	11/79	1	C
FOUR CORNERS	4	FARMINGTON	NEW MEXICO	0/82	3	C
FOUR CORNERS	5	FARMINGTON	NEW MEXICO	0/82	3	C
ASSOCIATED ELECTRIC COOP						
THOMAS HILL	3	MOBERLY	MISSOURI	1/82	2	A
ATLANTIC CITY ELECTRIC						
CUMBERLAND	1	MILLVILLE	NEW JERSEY	1/88	6	C
BASIN ELECTRIC POWER COOP						
ANTELOPE VALLEY	1	BEULAH	NORTH DAKOTA	4/83	2	D
ANTELOPE VALLEY	2	BEULAH	NORTH DAKOTA	10/85	5	C
LARAMIE RIVER	1	WHEATLAND	WYOMING	7/80	1	C
LARAMIE RIVER	2	WHEATLAND	WYOMING	6/81	2	C
LARAMIE RIVER	3	WHEATLAND	WYOMING	10/82	2	C
BIG RIVERS ELECTRIC						
D.B. WILSON	1			7/84	3	A
D.B. WILSON	2			1/86	3	A
GREEN	1	SEBREE	KENTUCKY	12/79	1	B
GREEN	2	SEBREE	KENTUCKY	11/80	1	B
CAJUN ELECTRIC POWER COOP						
CHICOT	1	SHREVEPORT	LOUISIANNA	0/86	6	A
CHICOT	2	SHREVEPORT	LOUISIANNA	0/88	6	A
CHICOT	3	SHREVEPORT	LOUISIANNA	0/92	6	A
CHICOT	4	SHREVEPORT	LOUISIANNA	0/94	6	A
OXBOW	1	DE SOTO PARISH	LOUISIANA	0/85	5	A
OXBOW	2	DE SOTO PARISH	LOUISIANA	0/85	6	A
CENTRAL ILLINOIS LIGHT						
DUCK CREEK	1	CANTON	ILLINOIS	7/76	1	B
DUCK CREEK	2	CANTON	ILLINOIS	1/86	5	A
CENTRAL ILLINOIS PUBLIC SERV						
NEWTON	1	NEWTON	ILLINOIS	9/79	1	B
NEWTON	2	NEWTON	ILLINOIS	12/82	7	A
CENTRAL MAINE POWER						
SEARS ISLAND	1	PENOBSCOT BAY	MAINE	1/89	6	A

1. OPERATIONAL UNITS
2. UNITS UNDER CONSTRUCTION
3. PLANNED - CONTRACT AWARDED
4. PLANNED - LETTER OF INTENT SIGNED
5. PLANNED - REQUESTING/EVALUATING BIDS
6. PLANNED - CONSIDERING ONLY FGD SYSTEMS
7. PLANNED - CONSIDERING FGD SYSTEMS; ALSO ALTERNATIVE METHODS

A. FEDERAL NSPS(6/79)
B. FEDERAL NSPS(12/71)
C. STANDARD(S) MORE STRINGENT THAN NSPS(6/79)
D. STANDARD(S) MORE STRINGENT THAN NSPS(12/71) BUT NOT MORE STRINGENT THAN NSPS(6/79)
E. STANDARD(S) EQUAL TO OR LESS STRINGENT THAN NSPS(12/71)

SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
CENTRAL POWER & LIGHT						
COLETO CREEK	2	FANNIN	TEXAS	9/86	6	A
CINCINNATI GAS & ELECTRIC						
EAST BEND	1	RABBITHASH	KENTUCKY	10/87	6	
EAST BEND	2	RABBITHASH	KENTUCKY	2/81	2	B
COLORADO UTE ELECTRIC ASSN						
CRAIG	1	CRAIG	COLORADO	10/80	1	D
CRAIG	2	CRAIG	COLORADO	12/79	1	D
CRAIG	3	CRAIG	COLORADO	0/82	3	D
COLUMBUS & SOUTHERN OHIO ELEC						
CONESVILLE	5	CONESVILLE	OHIO	1/77	1	D
CONESVILLE	6	CONESVILLE	OHIO	6/78	1	D
POSTON	5	NELSONVILLE	OHIO	8/86	6	D
POSTON	6	NELSONVILLE	OHIO	0/89	6	D
COMMONWEALTH EDISON						
POWERTON	51	PEKIN	ILLINOIS	4/80	1	E
COOPERATIVE POWER ASSOCIATION						
COAL CREEK	1	UNDERWOOD	NORTH DAKOTA	7/79	1	B
COAL CREEK	2	UNDERWOOD	NORTH DAKOTA	7/80	1	B
DELMARVA POWER & LIGHT						
DELAWARE CITY	1	DELAWARE CITY	DELAWARE	5/80	1	E
DELAWARE CITY	2	DELAWARE CITY	DELAWARE	5/80	1	E
DELAWARE CITY	3	DELAWARE CITY	DELAWARE	5/80	1	E
VIENNA	9	VIENNA	MARYLAND	6/87	6	A
DESERET GEN & TRANS COOP						
MOON LAKE	1	VERNAL	UTAH	9/84	3	A
MOON LAKE	2	VERNAL	UTAH	0/88	5	A
DUQUESNE LIGHT						
ELRAMA	1-4	ELRAMA	PENNSYLVANIA	10/75	1	D
PHILLIPS	1-6	SOUTH HEIGHT	PENNSYLVANIA	7/73	1	D
EAST KENTUCKY POWER COOP						
J.K. SMITH	1			1/85	4	A
J.K. SMITH	2			1/87	4	A
SPURLOCK	2	MAYSVILLE	KENTUCKY	10/81	2	B
FLORIDA POWER & LIGHT						
MARTIN	3	MARTIN COUNTY	FLORIDA	0/87	6	A
MARTIN	4	MARTIN COUNTY	FLORIDA	0/89	6	A
GENERAL PUBLIC UTILITIES						
COAL	1	UNDECIDED	UNDECIDED	5/91	5	A
COAL	2	UNDECIDED	UNDECIDED	5/93	6	A
COAL	3	UNDECIDED	UNDECIDED	5/95	6	A
COAL	4	UNDECIDED	UNDECIDED	5/96	6	A
SEWARD	7	EAST WHEATFIELD	PENNSYLVANIA	5/89	5	A

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COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
GRAND HAVEN BRD OF LIGHT & PWR						
J.B. SIMS	3	GRAND HAVEN	MICHIGAN	6/83	2	A
GULF POWER						
SCHOLZ	1	SNEADS	FLORIDA	8/80	1	E
HOOSIER ENERGY						
MEROM	1	MEROM	INDIANA	5/82	2	B
MEROM	2	MEROM	INDIANA	9/81	2	B
HOUSTON LIGHTING & POWER						
LIMESTONE	1	JEWITT	TEXAS	12/84	3	A
LIMESTONE	2	JEWETT	TEXAS	12/85	3	A
W.A. PARISH	8	BOOTH	TEXAS	11/82	2	A
INDIANAPOLIS POWER & LIGHT						
PATRIOT	1	PATRIOT	INDIANA	0/87	6	C
PATRIOT	2	PATRIOT	INDIANA	0/ 0	6	C
PATRIOT	3	PATRIOT	INDIANA	0/ 0	6	C
PETERSBURG	3	PETERSBURG	INDIANA	12/77	1	B
PETERSBURG	4	PETERSBURG	INDIANA	10/84	2	B
IOWA ELECTRIC LIGHT & PWR						
GUTHRIE CO.	1	PANORA	IOWA	11/84	5	A
JACKSONVILLE ELEC AUTHORITY						
ST.JOHNS RIVER PWR PARK	1	EAST PORT SITE	FLORIDA	12/85	6	A
ST.JOHNS RIVER PWR PARK	2	EAST PORT SITE	FLORIDA	6/87	6	A
KANSAS CITY POWER & LIGHT						
HAWTHORN	3	KANSAS CITY	MISSOURI	11/72	1	D
HAWTHORN	4	KANSAS CITY	MISSOURI	8/72	1	D
LA CYGNE	1	LA CYGNE	KANSAS	2/73	1	E
KANSAS POWER & LIGHT						
JEFFREY	1	WAMEGO	KANSAS	8/78	1	D
JEFFREY	2	WAMEGO	KANSAS	4/80	1	D
LAWRENCE	4	LAWRENCE	KANSAS	1/77	1	D
LAWRENCE	5	LAWRENCE	KANSAS	4/78	1	D
KENTUCKY UTILITIES						
GREEN RIVER	1-3	CENTRAL CITY	KENTUCKY	9/75	1	E
HANCOCK	1	HAWESVILLE	KENTUCKY	0/88	6	A
HANCOCK	2	HAWESVILLE	KENTUCKY	0/94	6	A
LAKELAND UTILITIES						
MCINTOSH	3	LAKELAND	FLORIDA	8/81	2	A
LANSING BOARD OF WATER & LIGHT						
ERICKSON	2	DELTA TOWNSHIP	MICHIGAN	1/87	6	C
LOS ANGELES DEPT OF WTR & PWR						
INTERMOUNTAIN	1	DELTA	UTAH	0/86	6	A
INTERMOUNTAIN	2	DELTA	UTAH	0/87	6	A
INTERMOUNTAIN	3	DELTA	UTAH	0/88	6	A
INTERMOUNTAIN	4	DELTA	UTAH	0/89	6	A

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LOUISVILLE GAS & ELECTRIC						
CANE RUN	4	LOUISVILLE	KENTUCKY	8/76	1	D
CANE RUN	5	LOUISVILLE	KENTUCKY	12/77	1	D
CANE RUN	6	LOUISVILLE	KENTUCKY	4/79	1	D
MILL CREEK	1	LOUISVILLE	KENTUCKY	12/80	1	E
MILL CREEK	2	LOUISVILLE	KENTUCKY	12/81	2	E
MILL CREEK	3	LOUISVILLE	KENTUCKY	8/78	1	D
MILL CREEK	4	LOUISVILLE	KENTUCKY	6/82	2	B
PADDY'S RUN	6	LOUISVILLE	KENTUCKY	4/73	1	E
TRIMBLE COUNTY	1	BEDFORD	KENTUCKY	7/85	5	A
TRIMBLE COUNTY	2	BEDFORD	KENTUCKY	7/88	5	A
LOWER COLORADO RIVER AUTH						
FAYETTE POWER PROJECT	3	LA GRANGE	TEXAS	0/88	6	A
MARQUETTE BOARD OF LIGHT & PWR						
SHIRAS	3	MARQUETTE	MICHIGAN	10/82	3	A
MICHIGAN SO CENTRAL PWR AGENCY						
PROJECT	1	LITCHFIELD	MICHIGAN	6/82	2	A
MIDDLE SOUTH UTILITIES						
ARKANSAS LIGNITE	5		ARKANSAS	0/90	4	A
ARKANSAS LIGNITE	6		ARKANSAS	0/92	4	A
UNASSIGNED	1		LOUISIANA	0/89	4	A
UNASSIGNED	2		LOUISIANA	0/93	4	A
WILTON	1	CONVENT	LOUISIANA	0/88	4	A
WILTON	2	CONVENT	LOUISIANA	0/91	4	A
MINNESOTA POWER & LIGHT						
CLAY BOSWELL	4	COHASSET	MINNESOTA	4/80	1	B
MINNKOTA POWER COOPERATIVE						
MILTON R. YOUNG	2	CENTER	NORTH DAKOTA	9/77	1	D
MONONGAHELA POWER						
PLEASANTS	1	BELMONT	WEST VIRGINIA	3/79	1	B
PLEASANTS	2	BELMONT	WEST VIRGINIA	10/80	1	B
MONTANA POWER						
COLSTRIP	1	COLSTRIP	MONTANA	9/75	1	B
COLSTRIP	2	COLSTRIP	MONTANA	5/76	1	B
COLSTRIP	3	COLSTRIP	MONTANA	0/83	2	C
COLSTRIP	4	COLSTRIP	MONTANA	0/84	2	C
MONTANA-DAKOTA UTILITIES						
COYOTE	1	BEULAH	NORTH DAKOTA	3/81	2	E
MUSCATINE POWER & WATER						
MUSCATINE	9	MUSCATINE	IOWA	9/82	3	B
NEBRASKA PUBLIC POWER DISTRICT						
FOSSIL III	1	SARGENT	NEBRASKA	3/87	6	A

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NEVADA POWER						
HARRY ALLEN	1	LAS VEGAS	NEVADA	6/86	6	A
HARRY ALLEN	2	LAS VEGAS	NEVADA	6/87	6	A
HARRY ALLEN	3	LAS VEGAS	NEVADA	6/88	6	A
HARRY ALLEN	4	LAS VEGAS	NEVADA	6/89	6	A
REID GARDNER	1	MOAPA	NEVADA	3/74	1	B
REID GARDNER	2	MOAPA	NEVADA	4/74	1	B
REID GARDNER	3	MOAPA	NEVADA	7/76	1	B
REID GARDNER	4	MOAPA	NEVADA	4/83	4	A
WARNER VALLEY	1	ST. GEORGE	UTAH	6/85	5	A
WARNER VALLEY	2	ST. GEORGE	UTAH	6/86	5	A
NEW YORK STATE ELEC & GAS						
SOMERSET	1	SOMERSET	NEW YORK	6/84	4	E
NIAGARA MOHAWK POWER COOP						
CHARLES R. HUNTLEY	66	BUFFALO	NEW YORK	4/82	2	E
NORTHERN INDIANA PUB SERVICE						
DEAN H. MITCHELL	11	GARY	INDIANA	7/76	1	E
SCHAHFER	17	WHEATFIELD	INDIANA	6/83	3	A
SCHAHFER	18	WHEATFIELD	INDIANA	6/85	3	A
NORTHERN STATES POWER						
METRO COAL	1	UNDECIDED	UNDECIDED	0/90	6	A
RIVERSIDE	6,7	MINNEAPOLIS	MINNESOTA	11/80	1	E
SHERBURNE	1	BECKER	MINNESOTA	3/76	1	D
SHERBURNE	2	BECKER	MINNESOTA	3/77	1	D
SHERBURNE	3	BECKER	MINNESOTA	0/85	6	A
WISCONSIN COAL	1	DURAND	WISCONSIN	0/91	6	A
PACIFIC GAS & ELECTRIC						
MONTEZUMA	1	COLLINSVILLE	CALIFORNIA	6/94	6	C
MONTEZUMA	2	COLLINSVILLE	CALIFORNIA	6/90	6	C
PACIFIC POWER & LIGHT						
JIM BRIDGER	1	ROCK SPRINGS	WYOMING	0/88	5	A
JIM BRIDGER	2	ROCK SPRINGS	WYOMING	0/84	5	A
JIM BRIDGER	3	ROCK SPRINGS	WYOMING	0/86	5	A
JIM BRIDGER	4	ROCK SPRINGS	WYOMING	9/79	1	D
PENNSYLVANIA POWER						
BRUCE MANSFIELD	1	SHIPPINGPORT	PENNSYLVANIA	12/75	1	D
BRUCE MANSFIELD	2	SHIPPINGPORT	PENNSYLVANIA	7/77	1	D
BRUCE MANSFIELD	3	SHIPPINGPORT	PENNSYLVANIA	6/80	1	D
PHILADELPHIA ELECTRIC						
CROMBY	1	PHOENIXVILLE	PENNSYLVANIA	5/83	2	D
EDDYSTONE	1	EDDYSTONE	PENNSYLVANIA	12/82	2	D
EDDYSTONE	2	EDDYSTONE	PENNSYLVANIA	12/82	2	D
PLAINS ELECTRIC G & T COOP						
PLAINS ESCALANTE	1	PREWITT	NEW MEXICO	12/83	3	B

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PLATTE RIVER POWER AUTHORITY						
RAWHIDE	1	FT, COLLINS	COLORADO	12/83	3	C
PUBLIC SERVICE INDIANA						
GIBSON	5	PRINCETON	INDIANA	0/82	2	B
PUBLIC SERVICE OF NEW MEXICO						
SAN JUAN	1	WATERFLOW	NEW MEXICO	4/78	1	C
SAN JUAN	2	WATERFLOW	NEW MEXICO	8/78	1	C
SAN JUAN	3	WATERFLOW	NEW MEXICO	12/79	1	C
SAN JUAN	4	WATERFLOW	NEW MEXICO	6/82	2	C
PWR AUTHORITY OF STATE OF NY						
FOSSIL		NEW YORK	NEW YORK	4/87	6	C
SALT RIVER PROJECT						
CORONADO	1	ST. JOHNS	ARIZONA	11/79	1	D
CORONADO	2	ST. JOHNS	ARIZONA	7/80	1	D
CORONADO	3	ST. JOHNS	ARIZONA	0/89	6	A
SAN MIGUEL ELECTRIC COOP						
SAN MIGUEL	1	SAN MIGUEL	TEXAS	8/81	2	B
SEMINOLE ELECTRIC						
SEMINOLE	1	PALATKA	FLORIDA	3/83	3	A
SEMINOLE	2	PALATKA	FLORIDA	3/85	3	A
SIERRA PACIFIC POWER						
VALMY	2	VALMY	NEVADA	8/84	7	A
SIKESTON BRD OF MUNICIPAL UTIL						
SIKESTON	1	SIKESTON	MISSOURI	6/81	2	B
SOUTH CAROLINA PUBLIC SERVICE						
CROSS	1	CROSS	SOUTH CAROLINA	3/85	3	A
CROSS	2	CROSS	SOUTH CAROLINA	1/84	3	A
WINYAH	2	GEORGETOWN	SOUTH CAROLINA	7/77	1	B
WINYAH	3	GEORGETOWN	SOUTH CAROLINA	5/80	1	B
WINYAH	4	GEORGETOWN	SOUTH CAROLINA	7/81	2	A
SOUTH MISSISSIPPI ELEC PWR						
R.D. MORROW, SR.	1	HATTISBURG	MISSISSIPPI	8/78	1	B
R.D. MORROW, SR.	2	HATTISBURG	MISSISSIPPI	6/79	1	B
SOUTHERN ILLINOIS POWER COOP						
MARION	4	MARION	ILLINOIS	5/79	1	B
MARION	5	MARION	ILLINOIS	0/88	6	A
SOUTHERN INDIANA GAS & ELEC						
A.B. BROWN	1	WEST FRANKLIN	INDIANA	3/79	1	B
SOUTHWESTERN ELECTRIC POWER						
DOLET HILLS	1	MANSFIELD	LOUISIANA	3/86	3	A
DOLET HILLS	2	MANSFIELD	LOUISIANA	3/88	6	A
HENRY W. PIRKEY	1	HALLSVILLE	TEXAS	12/84	3	B

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SOYLAND POWER COOP						
SOYLAND	1	UNDECIDED	ILLINOIS	0/87	6	A
SPRINGFIELD CITY UTILITIES						
SOUTHWEST	1	SPRINGFIELD	MISSOURI	4/77	1	B
SPRINGFIELD WATER, LIGHT & PWR						
DALLMAN	3	SPRINGFIELD	ILLINOIS	10/80	1	B
ST. JOE ZINC						
G.F. WEATON	1	MONACA	PENNSYLVANIA	11/79	1	B
SUNFLOWER ELECTRIC COOP						
HOLCOMB	1	HOLCOMB	KANSAS	9/83	3	A
TAMPA ELECTRIC						
BIG BEND	4	TAMPA	FLORIDA	3/85	3	A
TENNESSEE VALLEY AUTHORITY						
PARADISE	1	PARADISE	KENTUCKY	3/82	2	E
PARADISE	2	PARADISE	KENTUCKY	6/82	2	E
SHAWNEE	10A	PADUCAH	KENTUCKY	4/72	1	E
SHAWNEE	10B	PADUCAH	KENTUCKY	4/72	1	E
WIDOWS CREEK	7	BRIDGEPORT	ALABAMA	2/81	2	E
WIDOWS CREEK	8	BRIDGEPORT	ALABAMA	5/77	1	E
TEXAS MUNICIPAL POWER AGENCY						
GIBBONS CREEK	1	CARLOS	TEXAS	1/82	2	A
TEXAS POWER & LIGHT						
SANDOW	4	ROCKDALE	TEXAS	12/80	1	B
TWIN OAKS	1	BREMOND	TEXAS	8/84	3	A
TWIN OAKS	2	BREMOND	TEXAS	8/85	3	A
TEXAS UTILITIES						
FOREST GROVE	1	ATHENS	TEXAS	0/87	5	A
MARTIN LAKE	1	TATUM	TEXAS	4/77	1	B
MARTIN LAKE	2	TATUM	TEXAS	5/78	1	B
MARTIN LAKE	3	TATUM	TEXAS	2/79	1	B
MARTIN LAKE	4	TATUM	TEXAS	0/85	3	A
MILL CREEK	1	HENDERSON	TEXAS	0/85	6	A
MILL CREEK	2	HENDERSON	TEXAS	0/86	6	A
MONTICELLO	3	MT. PLEASANT	TEXAS	5/78	1	B
TUCSON ELECTRIC POWER						
SPRINGERVILLE	1	SPRINGERVILLE	ARIZONA	1/85	3	B
SPRINGERVILLE	2	SPRINGERVILLE	ARIZONA	3/87	3	B
UNITED POWER ASSOCIATION						
STANTON	1A	STANTON	NORTH DAKOTA	6/82	2	A
UTAH POWER & LIGHT						
HUNTER	1	CASTLE DALE	UTAH	5/79	1	B
HUNTER	2	CASTLE DALE	UTAH	6/80	1	B
HUNTER	3	CASTLE DALE	UTAH	6/83	3	A
HUNTER	4	CASTLE DALE	UTAH	6/85	3	A

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UTAH POWER & LIGHT						
HUNTINGTON	1	PRICE	UTAH	5/78	1	B
NAUGHTON	3	KEMMERER	WYOMING	6/81	2	C
WASHINGTON WATER POWER						
CRESTON COAL	1	CRESTON	WASHINGTON	0/87	6	A
WEST PENN POWER						
MITCHELL	33	COURTNEY	PENNSYLVANIA	8/82	3	C
WEST TEXAS UTILITIES						
OKLAUNION	1	OKLAUNION	TEXAS	12/86	5	A
OKLAUNION	2	OKLAUNION	TEXAS	0/90	6	A

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UNIT IDENTIFICATION	ABSTRACT
ALABAMA ELECTRIC COOP TOMBIGBEE 2 NEW 255 MW (GROSS) 179 MW (ESC) COAL 1.15 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 9/78	TOMBIGBEE 2 OF ALABAMA ELECTRIC COOP IS A PULVERIZED COAL BOILER LOCATED IN LEROY, ALABAMA. THE BOILER GENERATES A MAXIMUM FLUE GAS FLOW OF 953,000 ACFM AND BURNS BITUMINOUS COAL WITH AN AVERAGE SULFUR CONTENT OF 1.15% AND AN AVERAGE HEAT CONTENT OF 11,500 BTU/LB. THE UNIT SO2 EMMISSION LIMITATION VALUE IS 1.2 LB/MMBTU. PRIMARY PARTICULATE MATTER CONTROL IS PROVIDED BY A HOT SIDE ESP. THE SO2 REMOVAL EQUIPMENT CONSISTS OF TWO SPRAY TOWERS SUPPLIED BY PEABODY PROCESS SYSTEMS WHICH UTILIZE A LIMESTONE REAGENT. A CHEVRON MIST ELIMINATOR IS INCLUDED FOR EACH TOWER AND THE FLUE GAS IS REHEATED WITH BYPASSED GAS BEFORE BEING VENTED TO A 400 FOOT ACID-BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND SPENT ABSORBENT IS DISPOSED OF IN AN ON-SITE LINED POND.
ALABAMA ELECTRIC COOP TOMBIGBEE 3 NEW 255 MW (GROSS) 179 MW (ESC) COAL 1.15 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 6/79	TOMBIGBEE 3 OF ALABAMA ELECTRIC COOP IS A PULVERIZED COAL BOILER LOCATED IN LEROY, ALABAMA. THE BOILER GENERATES A MAXIMUM FLUE GAS FLOW OF 953,000 ACFM AND BURNS BITUMINOUS COAL WITH AN AVERAGE SULFUR CONTENT OF 1.15% AND AN AVERAGE HEAT CONTENT OF 11,500 BTU/LB. THE UNIT SO2 EMISSION LIMITATION VALUE IS 1.2 LB/MMBTU. PRIMARY PARTICULATE CONTROL IS PROVIDED BY A HOT SIDE ESP. THE SO2 REMOVAL EQUIPMENT CONSISTS OF TWO SPRAY TOWERS SUPPLIED BY PEABODY PROCESS SYSTEMS WHICH UTILIZE A LIMESTONE REAGENT. A CHEVRON MIST ELIMINATOR IS INCLUDED IN EACH TOWER, AND THE FLUE GAS IS REHEATED WITH BYPASSED GAS BEFORE BEING VENTED TO A 400 FOOT ACID BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE, AND SPENT ABSORBENT IS DISPOSED IN AN ON-SITE LINED POND.
ARIZONA ELECTRIC POWER COOP APACHE 2 NEW 195 MW (GROSS) 98 MW (ESC) COAL .50 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 4.1% STATUS 1 STARTUP 8/78	APACHE 2 OF ARIZONA ELECTRIC POWER COOP IS LOCATED IN COCHISE, ARIZONA AND IS A DRY BOTTOM PULVERIZED COAL FIRED UNIT WITH A FLUE GAS FLOW OF 735,000 ACFM. BITUMINOUS COAL WITH A HEATING VALUE OF 10,000 BTU/LB, A SULFUR CONTENT OF 0.55% AND AN ASH CONTENT OF 15% IS THE FUEL USED FOR THIS UNIT. PARTICULATE CONTROL IS EFFECTED BY A HOT SIDE ESP. HALF THE FLUE GAS PASSES THROUGH TWO PACKED TOWERS EMPLOYING LIMESTONE ABSORBENT AND HAVING A DESIGN SO2 REMOVAL OF 85% WERE SUPPLIED BY RESEARCH-COTTRELL. MIST ELIMINATION IS PROVIDED BY CHEVRON TYPE ELIMINATORS. NO REHEAT IS EMPLOYED. A 400 FT COLE BRAND CXL2000 LINED STACK IS IN USE. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND WASTE MATERIAL IS DISPOSED OF IN OFF-SITE SLUDGE PONDS. OPERATIONS COMMENCED IN AUGUST 1978.
ARIZONA ELECTRIC POWER COOP APACHE 3 NEW 195 MW (GROSS) 98 MW (ESC) COAL .50 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 4.1% STATUS 1 STARTUP 6/79	APACHE 3 OF ARIZONA ELECTRIC POWER COOP IS A DRY BOTTOM, PULVERIZED COAL FIRED UNIT IN COCHISE, ARIZONA. LOW (0.55%) SULFUR BITUMINOUS COAL WITH AN AVERAGE HEATING VALUE OF 10,000 BTU/LB PRODUCES A MAXIMUM FLUE GAS FLOW OF 735,000 ACFM. HALF OF THE FLUE GAS PASSES THROUGH A HOT SIDE ESP TO TWO RESEARCH COTTRELL PACKED TOWERS, WHERE LIMESTONE IS USED TO REMOVE 85% OF THE SO2. THE GAS EXITS A HORIZONTAL CHEVRON MIST ELIMINATOR INTO ITS OWN CEILCOTE LINED FLUE IN THE 400 FOOT STACK IT SHARES WITH UNIT 2. THE FGD, WHICH HAS BEEN OPERATIONAL SINCE JUNE OF 1979, USES NO REHEAT. THE SYSTEM OPERATES IN AN OPEN WATER LOOP AND SLUDGE IS DISPOSED OF IN TWO OFF SITE LINED PONDS WITH 20 YEARS' EXPECTED LIFESPAN. TWO ADDITIONAL PONDS ARE PLANNED, WHICH WOULD ADD ANOTHER 20 YEARS' CAPACITY.
ARIZONA PUBLIC SERVICE CHOLLA 1 RETROFIT 119 MW (GROSS) 119 MW (ESC) COAL .50 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 3.4% STATUS 1 STARTUP 10/73	ARIZONA PUBLIC SERVICE'S CHOLLA 1 IS LOCATED IN JOSEPH CITY, ARIZONA AND IS A TANGENTIALLY FIRED, WET BOTTOM PULVERIZED COAL UNIT. IT IS FUELED BY BITUMINOUS COAL THAT HAS A SULFUR CONTENT OF 0.5% AND A HEATING VALUE OF 10,150 BTU/LB. PARTICULATE MATTER IS CONTROLLED BY TWO FLOODED DISC SCRUBBERS. THE FGD SYSTEM BEGAN IN OCTOBER, 1973 AND IS NOW OPERATIONAL. SO2 IS CONTROLLED BY ONE TOWER WITH MUNTERS PACKING EMPLOYING A LIMESTONE ABSORBENT. THE UNIT WAS SUPPLIED BY RESEARCH COTTRELL AND HAS A DESIGN REMOVAL OF 92%. CHEVRON MIST ELIMINATORS ARE LOCATED PRIOR TO AN IN-LINE STEAM REHEAT SYSTEM. THE TREATED FLUE GAS IS VENTED TO A 256 FT ACID BRICK LINED STACK. THE FGD SYSTEM OPERATES IN AN OPEN WATER LOOP MODE AND THE UNTREATED WASTE IS DISPOSED OF IN AN ON-SITE UNLINED POND.
ARIZONA PUBLIC SERVICE CHOLLA 2 NEW 264 MW (GROSS) 264 MW (ESC) COAL .50 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/78	CHOLLA 2 OF ARIZONA PUBLIC SERVICE IS LOCATED IN JOSEPH CITY, ARIZONA. THE BOILER BURNS PULVERIZED BITUMINOUS COAL (0.5% S, 10,150 BTU/LB). MECHANICAL COLLECTORS PROVIDE PRIMARY PARTICULATE CONTROL. FOUR PARALLEL FLOODED DISC AND PACKED TOWER SO2 ABSORBER TRAINS (THREE ARE REQUIRED FOR FULL LOAD) REMOVE THE FLUE GAS SO2. THE DESIGN SO2 REMOVAL FOR THE SYSTEM, WHICH BEGAN OPERATIONS IN APRIL, 1978, IS 75%. THE CLEANED GAS PASSES THROUGH AN IN-LINE STEAM REHEATER INTO AN ACID BRICK LINED STACK. THE OPEN WATER LOOP SYSTEM DEPOSITS ITS SLUDGE INTO A FLY ASH POND.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ARIZONA PUBLIC SERVICE CHOLLA 4 NEW 375 MW (GROSS) 126 MW (ESC) COAL .50 %S LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 2/81	CHOLLA 4 OF ARIZONA PUBLIC SERVICE IS PRESENTLY UNDER CONSTRUCTION IN JOSEPH CITY, ARIZONA. THE PULVERIZED COAL (0.5% S, 10,150 BTU/LB) FIRED BOILER WILL EXHAUST FLUE GAS THROUGH AN ESP TO A DOUBLE LOOP COMBINATION TOWER (RESEARCH-COTTRELL DESIGN) WHICH WILL TREAT 36% OF THE GAS WITH LIMESTONE. THE SYSTEM IS SCHEDULED TO START UP IN FEBRUARY 1981.
ARIZONA PUBLIC SERVICE FOUR CORNERS 1 RETROFIT 175 MW (GROSS) 175 MW (ESC) COAL .75 %S SUBBITUMINOUS LIME/ALKALINE FLYASH CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 11/79	ARIZONA PUBLIC SERVICE HAS UPGRADED THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1, 2, AND 3 IN FARMINGTON, NEW MEXICO TO HANDLE ADDITIONAL SO2 REMOVAL. INITIALLY, THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUBBITUMINOUS, 0.75% S, 8650 BTU/LB) UNITS 1 AND 2 SUPPLY 814,000 ACFM EACH INTO 2 CHEMICO VENTURI SCRUBBERS PER UNIT FOR PRIMARY PARTICULATE CONTROL AND APPROXIMATELY 30% SO2 REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO2 REMOVAL EFFICIENCY SINCE THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. OPERATIONS COMMENCED IN NOVEMBER, 1979.
ARIZONA PUBLIC SERVICE FOUR CORNERS 2 RETROFIT 175 MW (GROSS) 175 MW (ESC) COAL .75 %S SUBBITUMINOUS LIME/ALKALINE FLYASH CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 11/79	ARIZONA PUBLIC SERVICE HAS UPGRADED THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1,2, AND 3 IN FARMINGTON, NEW MEXICO TO HANDLE ADDITIONAL SO2 REMOVAL. INITIALLY, THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUBBITUMINOUS, 0.75% S, 8650 BTU/LB) UNITS 1 AND 2 SUPPLY 814,000 ACFM EACH INTO 2 CHEMICO VENTURI SCRUBBERS PER UNIT FOR PRIMARY PARTICULATE CONTROL AND APPROXIMATELY 30% SO2 REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO2 REMOVAL EFFICIENCY SINCE THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. OPERATIONS COMMENCED IN NOVEMBER, 1979.
ARIZONA PUBLIC SERVICE FOUR CORNERS 3 RETROFIT 229 MW (GROSS) 229 MW (ESC) COAL .75 %S SUBBITUMINOUS LIME/ALKALINE FLYASH CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 11/79	ARIZONA PUBLIC SERVICE HAS UPGRADED THE OPERATIONAL PARTICULATE SCRUBBERS AT FOUR CORNERS 1,2, AND 3 IN FARMINGTON, NEW MEXICO TO HANDLE ADDITIONAL SO2 REMOVAL. INITIALLY, THE FRONT FIRED, DRY BOTTOM, PULVERIZED COAL (SUBBITUMINOUS, 0.75% S, 8650 BTU/LB) UNIT 3 SUPPLIES 1,030,000 ACFM INTO 2 CHEMICO VENTURI SCRUBBERS FOR PRIMARY PARTICULATE CONTROL AND APPROXIMATELY 30% SO2 REMOVAL USING ALKALINE FLY ASH. THE DESIGN SO2 REMOVAL EFFICIENCY SINCE THE CONVERSION TO LIME AND ALKALINE FLY ASH SCRUBBING IS 67.5%. OPERATIONS COMMENCED IN NOVEMBER, 1979.
ARIZONA PUBLIC SERVICE FOUR CORNERS 4 RETROFIT 755 MW (GROSS) 755 MW (ESC) COAL .75 %S LIME UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/82	ARIZONA PUBLIC SERVICE AWARDED A CONTRACT TO UNITED ENGINEERS FOR A LIME FGD SYSTEM TO BE RETROFITTED ONTO UNITS 4 AND 5 AT ITS FOUR CORNERS STATION IN FARMINGTON, NEW MEXICO. BASED ON THE PROTOTYPE HORIZONTAL SCRUBBING PROGRAM CONDUCTED BY THE UTILITY, A HORIZONTAL SYSTEM WAS CHOSEN TO CONTROL THE EMISSIONS FROM THESE COAL (0.75% S, 8650 BTU/LB) FIRED UNITS. THE PARTICULATE EMISSIONS ARE HANDLED BY AN ESP. START UP IS EXPECTED IN 1982.
ARIZONA PUBLIC SERVICE FOUR CORNERS 5 RETROFIT 755 MW (GROSS) 755 MW (ESC) COAL .75 %S LIME UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/82	ARIZONA PUBLIC SERVICE AWARDED A CONTRACT TO UNITED ENGINEERS FOR A LIME FGD SYSTEM TO BE RETROFITTED ONTO UNITS 4 AND 5 AT ITS FOUR CORNERS STATION IN FARMINGTON, NEW MEXICO. BASED ON THE PROTOTYPE HORIZONTAL SCRUBBING PROGRAM CONDUCTED BY THE UTILITY, A HORIZONTAL SYSTEM WAS CHOSEN TO CONTROL THE EMISSIONS FROM THESE COAL (0.75% S, 8650 BTU/LB) FIRED UNITS. THE PARTICULATE EMISSIONS ARE HANDLED BY AN ESP. START UP IS EXPECTED IN 1982.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ASSOCIATED ELECTRIC COOP THOMAS HILL 3 NEW 730 MW (GROSS) 670 MW (ESC) COAL 4.80 %S LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 1/82	THOMAS HILL 3 OF ASSOCIATED ELECTRIC COOP IS A PULVERIZED COAL (4.8% S, 9,700 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN MOBERLY, MISSOURI. TWO COLD SIDE ESP'S WILL PRECEDE THE FOUR 91.5% EFFICIENT PULLMAN KELLOGG HORIZONTA WEIR FGD MODULES USING MAGNESIUM-PROMOTED LIMESTONE AS THE ABSORBENT. THE CLEANED GAS WILL PASS THROUGH A VERTICAL CHEVRON MIST ELIMINATOR TO A 620 FOOT BRICK LINED STACK. REHEAT WILL BE ACCOMPLISHED BY BYPASS. DRY FIXATED SLUDGE WILL BE TRUCKED TO AN ACTIVE STRIP MINE. THE SYSTEM WILL USE A CLOSED WATER LOOP. THE FGD SYSTEM IS UNDER CONSTRUCTION AND START UP IS EXPECTED IN JANUARY 1982.
ATLANTIC CITY ELECTRIC CUMBERLAND 1 NEW 330 MW (GROSS) 330 MW (ESC) COAL 3.25 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 1/88	CUMBERLAND 1 IS A PULVERIZED COAL (3.25%S) FIRED BOILER TO BE LOCATED IN MILLVILLE, NEW JERSEY. THE UTILITY IS CONSIDERING AN FGD SYSTEM WITH A THROWAWAY PRODUCT FOR SO2 CONTROL. OPERATIONS ARE SCHEDULED TO BEGIN IN JANUARY 1988.
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY 1 NEW 440 MW (GROSS) 440 MW (ESC) COAL .68 %S LIGNITE LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 4/83	UNIT 1 OF BASIN ELECTRIC POWER COOP'S ANTELOPE VALLEY PLANT IS PRESENTLY UNDER CONSTRUCTION IN BEULAH, NORTH DAKOTA. THIS UNIT WILL BURN PULVERIZED COAL (0.68% S, 6600 BTU/LB LIGNITE) AND SUPPLY 2,055,000 ACFM TO A DRY LIME FGD SYSTEM SUPPLIED BY WESTERN PRECIPITATION. THE 62% EFFICIENT SYSTEM WILL CONSIST OF 5 NIRO ATOMIZER SPRAY DRYERS AND TWO BAGHOUSES. THE CLEANED GAS, ALONG WITH A 4% BYPASS REHEAT, WILL EXIT A 600 FOOT PVC LINED STACK. THE SYSTEM WILL USE A CLOSED WATER LOOP AND THE DRY POWDER WILL BE USED FOR LANDFILL IN A COAL MINE. START UP IS EXPECTED IN APRIL 1983.
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY 2 NEW 440 MW (GROSS) 440 MW (ESC) COAL .68 %S LIGNITE LIME/SPRAY DRYING VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 10/85	ANTELOPE VALLEY 2 OF BASIN ELECTRIC POWER COOP WILL BE LOCATED IN BEULAH, NORTH DAKOTA. THE UTILITY IS PRESENTLY CONSIDERING VARIOUS FGD PROCESSES FOR THIS LIGNITE (0.68% S, 6600 BTU/LB) FIRED UNIT. THE UNIT WILL BE REQUIRED TO COMPLY WITH STATE EMISSIONS STANDARDS VIA BEST AVAILABLE CONTROL TECHNOLOGY. START UP IS SCHEDULED FOR OCTOBER 1985.
BASIN ELECTRIC POWER COOP LARAMIE RIVER 1 NEW 570 MW (GROSS) 570 MW (ESC) COAL .81 %S SUBBITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: .0% STATUS 1 STARTUP 7/80	BASIN ELECTRIC POWER COOP'S LARAMIE RIVER 1 IS A PULVERIZED COAL (0.8% S, 8139 BTU/LB) FIRED UNIT LOCATED IN WHEATLAND, WYOMING. THE BOILER FEEDS 2,300,000 ACFM OF FLUE GAS THROUGH A COLD SIDE ESP TO FIVE RESEARCH COTTRELL LIMESTONE PACKED TOWER MODULES, WHICH REMOVE 90% OF THE SO2. THE CLEANED GAS EXITS FROM A VERTICAL CHEVRON MIST ELIMINATOR INTO A 600 FOOT ACID BRICK LINED STACK. NO REHEAT IS USED. THE FLYASH FIXATED SLUDGE IS DEWATERED TO 83% SOLIDS BEFORE BEING LANDFILLED, AND THE SYSTEM EMPLOYS A CLOSED WATER LOOP. OPERATIONS BEGAN ON JULY 1, 1980.
BASIN ELECTRIC POWER COOP LARAMIE RIVER 2 NEW 570 MW (GROSS) 570 MW (ESC) COAL .81 %S SUBBITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/81	BASIN ELECTRIC POWER COOP'S LARAMIE RIVER 2 IS PRESENTLY UNDER CONSTRUCTION IN WHEATLAND, WYOMING. THE PULVERIZED COAL (0.81% S, 8139 BTU/LB) FIRED BOILER WILL FEED 2,300,000 ACFM OF FLUE GAS THROUGH A COLD SIDE ESP TO FIVE RESEARCH COTTRELL LIMESTONE PACKED TOWER MODULES, WHICH WILL REMOVE 90% OF THE SO2. THE CLEANED GAS WILL EXIT FROM A VERTICAL CHEVRON MIST ELIMINATOR INTO A 600 FOOT ACID BRICK LINED STACK. NO REHEAT WILL BE USED. THE FLYASH FIXATED SLUDGE WILL BE DEWATERED TO 83% SOLIDS BEFORE BEING LANDFILLED, AND THE SYSTEM WILL EMPLOY A CLOSED WATER LOOP. START UP IS SCHEDULED FOR JUNE 1981.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
BASIN ELECTRIC POWER COOP LARAMIE RIVER 3 NEW 570 MW (GROSS) 570 MW (ESC) COAL .54 %S SUBBITUMINOUS LIME/SPRAY DRYING BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/82	LARAMIE RIVER 3 OF BASIN ELECTRIC POWER COOP IS UNDER CONSTRUCTION IN WHEATLAND, WYOMING, AND WILL UTILIZE FOUR DRY LIME INJECTION MODULES, AND A COLD SIDE ESP. THE BOILER WILL FIRE PULVERIZED COAL (0.54% S, 8100 BTU/LB) AND WILL SUPPLY 2,800,000 ACFM OF FLUE GAS TO THE FGD SYSTEM, WHICH WILL REMOVE 85% OF THE SO2 BEFORE THE GAS EXITS THROUGH A 600 FOOT ACID BRICK LINED STACK. A 3% BYPASS WILL BE USED FOR REHEAT. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND WILL LANDFILL THE DRY POWDER WASTE. OPERATIONS ARE SCHEDULED TO COMMENCED IN OCTOBER 1982.
BIG RIVERS ELECTRIC D.B. WILSON 1 NEW 440 MW (GROSS) 440 MW (ESC) COAL ***** %S BITUMINOUS LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 7/84	BIG RIVERS ELECTRIC HAS PLANS FOR TWO NEW UNITS, D.B. WILSON 1 AND 2. THE PULVERIZED COAL FIRED BOILERS WILL HAVE A MW RATING OF 440 EACH. PULLMAN KELLOG HAS BEEN AWARDED A CONTRACT FOR A WET LIMESTONE FGD SYSTEM. STARTUP IS SCHEDULED FOR JULY 1984.
BIG RIVERS ELECTRIC D.B. WILSON 2 NEW 440 MW (GROSS) 440 MW (ESC) COAL ***** %S BITUMINOUS LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 1/86	BIG RIVERS ELECTRIC HAS PLANS FOR TWO NEW UNITS, D.B. WILSON 1 AND 2. THE PULVERIZED COAL FIRED BOILERS WILL HAVE A MW RATING OF 440 EACH. PULLMAN KELLOG HAS BEEN AWARDED A CONTRACT FOR A WET LIMESTONE FGD SYSTEM. STARTUP IS SCHEDULED FOR JANUARY 1986.
BIG RIVERS ELECTRIC GREEN 1 NEW 242 MW (GROSS) 242 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 12/79	UNIT 1 OF BIG RIVERS ELECTRIC'S GREEN STATION IS LOCATED IN SEBREE,KENTUCKY. THE DRY BOTTOM PULVERIZED COAL (3.75% S, 9750 BTU/LB) FIRED BOILER SUPPLIES 1,000,000 ACFM TO A COLD SIDE ESP FOLLOWED BY TWO AMERICAN AIR FILTER LIME SPRAY TOWERS WHICH WILL REMOVE 90% OF THE SO2. THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR AND EXITS A SAUERISEN 72 LINED STACK AFTER IT IS HEATED BY STEAM COIL REHEATER. THE SLUDGE FROM THE CLOSED WATER LOOP SYSTEM IS POZ-O-TEC STABILIZED. OPERATIONS COMMENCED IN DECEMBER 1979.
BIG RIVERS ELECTRIC GREEN 2 NEW 242 MW (GROSS) 242 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 11/80	UNIT 2 OF BIG RIVERS ELECTRIC'S GREEN STATION IS LOCATED IN SEBREE, KENTUCKY. THE DRY BOTTOM PULVERIZED COAL (3.75% S, 9750 BTU/LB) FIRED BOILER SUPPLIES 1,000,000 ACFM TO A COLD SIDE ESP FOLLOWED BY TWO AMERICAN AIR FILTER LIME SPRAY TOWERS WHICH REMOVE 90% OF THE SO2. THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR AND EXITS A SAUERISEN 72 LINED STACK AFTER IT IS HEATED BY A STEAM COIL REHEATER. THE SLUDGE FROM THE CLOSED WATER LOOP SYSTEM IS POZ-O-TEC STABILIZED. OPERATIONS COMMENCED IN NOVEMBER 1980.
CAJUN ELECTRIC POWER COOP CHICOT 1 NEW 540 MW (GROSS) 540 MW (ESC) LIGNITE 1.70 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/86	CAJUN ELECTRIC POWER COOP HAS PLANS FOR A NEW UNIT, CHICOT 1, TO BE LOCATED IN SHREVEPORT, LOUISIANA. THE UTILITY IS CONSIDERING A DRY SCRUBBING FGD SYSTEM FOR EMISSION CONTROL FROM THE LIGNITE FIRED BOILER. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1986.

UNIT IDENTIFICATION	ABSTRACT
CAJUN ELECTRIC POWER COOP CHICOT 2 NEW 540 MW (GROSS) 540 MW (ESC) LIGNITE 1.70 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/88	CAJUN ELECTRIC POWER COOP HAS PLANS FOR A NEW UNIT, CHICOT 2, TO BE LOCATED IN SHREVEPORT, LOUISIANA. THE UTILITY IS CONSIDERING A DRY SCRUBBING FGD SYSTEM FOR EMISSION CONTROL FROM THE LIGNITE FIRED BOILER. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1988.
CAJUN ELECTRIC POWER COOP CHICOT 3 NEW 540 MW (GROSS) 540 MW (ESC) LIGNITE 1.70 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/92	CAJUN ELECTRIC POWER COOP HAS PLANS FOR A NEW UNIT, CHICOT 3, TO BE LOCATED IN SHREVEPORT, LOUISIANA. THE UTILITY IS CONSIDERING A DRY SCRUBBING FGD SYSTEM FOR EMISSION CONTROL FROM THE LIGNITE FIRED BOILER. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1992.
CAJUN ELECTRIC POWER COOP CHICOT 4 NEW 540 MW (GROSS) 540 MW (ESC) LIGNITE 1.70 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/94	CAJUN ELECTRIC POWER COOP HAS PLANS FOR A NEW UNIT, CHICOT 4, TO BE LOCATED IN SHREVEPORT, LOUISIANA. THE UTILITY IS CONSIDERING A DRY SCRUBBING FGD SYSTEM FOR EMISSION CONTROL FROM THE LIGNITE FIRED BOILER. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1994.
CAJUN ELECTRIC POWER COOP OXBOW 1 NEW 540 MW (GROSS) 540 MW (ESC) COAL .60 %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/85	CAJUN ELECTRIC HAS PLANS TO CONSTRUCT A 540 MW UNIT, OXBOW 1, TO BE LOCATED IN DE SOLO PARISH, LOUISIANA. THE UTILITY IS REQUESTING BIDS FOR A DRY SCRUBBING PROCESS TO CONTROL EMISSIONS FROM THE PULVERIZED COAL FIRED BOILER. THE UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN 1985.
CAJUN ELECTRIC POWER COOP OXBOW 2 NEW 540 MW (GROSS) 540 MW (ESC) COAL .60 %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/85	CAJUN ELECTRIC HAS PLANS TO CONSTRUCT A 540 MW UNIT, OXBOW 2, TO BE LOCATED IN DE SOLO PARISH, LOUISIANA. THE UTILITY IS PRESENTLY CONSIDERING A DRY SCRUBBING PROCESS TO CONTROL EMISSIONS FROM THE PULVERIZED COAL FIRED BOILER. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1985.
CENTRAL ILLINOIS LIGHT DUCK CREEK 1 NEW 416 MW (GROSS) 416 MW (ESC) COAL 3.66 %S BITUMINOUS LIMESTONE ENVIRONEERING, RILEY STOKER ENERGY CONSUMPTION: 2.9% STATUS 1 STARTUP 7/76	DUCK CREEK 1 OF CENTRAL ILLINOIS LIGHT IS LOCATED IN CANTON, ILLINOIS. THE BALANCED DRAFT, FRONT FIRED, DRY BOTTOM UNIT BURNS PULVERIZED BITUMINOUS COAL (3.66% S, 10,500 BTU/LB) AND SUPPLIES 2,415,000 ACFM OF FLUE GAS TO TWO COLD SIDE ESP'S FOLLOWED BY FOUR RILEY STOKER/ENVIRONEERING ROD DECK SPRAY TOWER MODULES. THE FGD SYSTEM HAS BEEN OPERATIONAL (ONE MODULE) SINCE JULY, 1976, AND IS DESIGNED TO REMOVE 85% OF THE SO2. HORIZONTAL CHEVRON MIST ELIMINATORS FOLLOW THE ABSORBERS, AND THE CLEANED GAS EXITS TO A 500 FOOT CEILCOTE LINED STACK WITHOUT REHEAT. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE SLUDGE IS DISPOSED OF IN AN ON SITE CLAY LINED POND.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
CENTRAL ILLINOIS LIGHT DUCK CREEK 2 NEW 450 MW (GROSS) 450 MW (ESC) COAL 3.30 %S BITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 1/86	CENTRAL ILLINOIS LIGHT IS CURRENTLY EVALUATING BIDS ON A LIMESTONE OR DUAL ALKALI FGD SYSTEM FOR UNIT 2 OF ITS DUCK CREEK STATION. THE BITUMINOUS COAL FIRED BOILER WILL FEED ITS FLUE GAS THROUGH A COLD SIDE ESP. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP AND IS SCHEDULED TO BEGIN OPERATIONS IN JANUARY, 1986.
CENTRAL ILLINOIS PUBLIC SERV NEWTON 1 NEW 617 MW (GROSS) 617 MW (ESC) COAL 2.25 %S BITUMINOUS DUAL ALKALI BUELL DIVISION, ENVIROTECH ENERGY CONSUMPTION: 2.4% STATUS 1 STARTUP 9/79	NEWTON 1 OF CENTRAL ILLINOIS PUBLIC SERVICE IS A TANGENTIALLY FIRED, DRY BOTTOM, PULVERIZED BITUMINOUS COAL (2.25% S, 10,900 BTU/LB) FIRED UNIT LOCATED IN NEWTON, ILLINOIS. A COLD SIDE ESP RECEIVES 2,163,480 ACFM OF FLUE GAS AND FEEDS IT TO FOUR BUELL ENVIROTECH POLYSPHERE PACKED TRAY TOWERS FOLLOWED BY TWO VERTICAL MIST ELIMINATORS PER MODULE. THE CLEANED GAS IS BOOSTED 25 DEG F BY A COMBINATION OF TWO DIFFERENT TYPES OF IN-LINE REHEATERS PLUS BYPASS REHEAT, AND THEN EXITS A 530 FOOT PRECRETE LINED STACK. THE WATER LOOP IS CLOSED, AND THE SLUDGE IS POZ-O-TEC TREATED.
CENTRAL ILLINOIS PUBLIC SERV NEWTON 2 NEW 617 MW (GROSS) 617 MW (ESC) COAL 4.00 %S BITUMINIOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.4% STATUS 7 STARTUP 12/82	NEWTON 2 OF CENTRAL ILLINOIS PUBLIC SERVICE IS A 617 MW UNIT TO BE LOCATED IN NEWTON, ILLINOIS. THE COMBUSTION ENGINEERING COAL FIRED BOILER WILL UTILIZE AN FGD SYSTEM OR FIRE LOW SULFUR COAL TO CONTROL SO2 EMISSIONS. THE UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN DECEMBER 1982.
CENTRAL MAINE POWER SEARS ISLAND 1 NEW 600 MW (GROSS) 600 MW (ESC) COAL 2.23 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 1/89	SEARS ISLAND 1 IS A PLANNED UNIT TO BE BUILT ON PENOBSCOT BAY BY CENTRAL MAINE POWER. BECAUSE OF THE DISCOVERY OF A GEOLOGICAL FAULT ON SEARS ISLAND, PLANS FOR A 1150 MW NUCLEAR POWER PLANT HAVE BEEN REPLACED WITH PLANS FOR A 600 MW COAL FIRED PLANT. LIME AND LIMESTONE SCRUBBING ARE THE PRIMARY METHODS BEING CONSIDERED FOR COMPLIANCE WITH THE NSPS. IT WILL BE TWO YEARS BEFORE ALL PERMITS REQUIRED HAVE BEEN RECEIVED. START UP IS SCHEDULED FOR NOVEMBER 1989.
CENTRAL POWER & LIGHT COLETO CREEK 2 NEW 720 MW (GROSS) 720 MW (ESC) COAL .39 %S SUBBITUMINIOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 9/86	COLETO CREEK 2 OF CENTRAL POWER AND LIGHT IS A COAL (.39%S) FIRED UNIT PLANNED FOR CONSTRUCTION IN FANNIN, TEXAS. THE UNIT IS BEING BUILT BY CENTRAL AND SOUTHWEST SERVICES, BUT WILL BE OPERATED BY CENTRAL POWER AND LIGHT. ONLY DRY SCRUBBING IS BEING CONSIDERED FOR SO2 CONTROL. SCHEDULED STARTUP IS FOR SEPTEMBER 1986.
CINCINNATI GAS & ELECTRIC EAST BEND 1 NEW 650 MW (GROSS) 650 MW (ESC) COAL 4.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.9% STATUS 6 STARTUP 10/87	CINCINNATI GAS AND ELECTRIC HAS PLANS FOR A NEW UNIT, EAST BEND 1, TO BE LOCATED ADJACENT TO EAST BENT 2 AT THE RABBITHASH, KENTUCKY SITE. THE COAL FIRED BOILER WILL HAVE A GENERATING CAPACITY OF 650 MW. THE UNIT IS SCHEDULED TO STARTUP IN OCTOBER 1987.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
CINCINNATI GAS & ELECTRIC EAST BEND 2 NEW 650 MW (GROSS) 650 MW (ESC) COAL 4.00 %S LIME BABCOCK & WILCOX ENERGY CONSUMPTION: 2.9% STATUS 2 STARTUP 2/81	EAST BEND 2 OF CINCINNATI GAS AND ELECTRIC IS A PULVERIZED COAL (5% S) FIRED BOILER UNDER CONSTRUCTION IN RABBITHASH, KENTUCKY. THE EMISSION CONTROL SYSTEM CONSISTS OF A HOT SIDE ESP FOLLOWED BY THREE BABCOCK AND WILCOX LIME FGD MODULES. THE 87% CLEANED GAS WILL PASS THROUGH A CHEVRON MIST ELIMINATOR BEFORE BEING WARMED BY AN INDIRECT HOT AIR REHEATER AND EXITING THROUGH A BRICK LINED 650 FOOT STACK. THE SLUDGE FROM THIS CLOSED WATER LOOP SYSTEM WILL BE POZ-O-TEC STABILIZED BEFORE DISPOSAL IN AN ON SITE LANDFILL. START UP IS EXPECTED IN FEBRUARY 1981.
COLORADO UTE ELECTRIC ASSN CRAIG 1 NEW 447 MW (GROSS) 447 MW (ESC) COAL .45 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 5.4% STATUS 1 STARTUP 10/80	THE COLORADO UTE ELECTRIC ASSN HAS CONSTRUCTED A NEW UNIT, CRAIG 1, LOCATE IN CRAIG, COLORADO. BOTH UNITS FIRE PULVERIZED SUBBITUMINOUS COAL (0.45% 10,000 BTU/LB). THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HO SIDE ESP AND FOUR MAGNESIUM PROMOTED LIMESTONE SPRAY TOWERS FOR REMOVAL OF PARTICULATE MATTER AND 85% OF THE SO2. THE SCRUBBER EXHAUST IS HEATED BY AN IN-LINE STEAM COIL REHEATER AND PASSES THROUGH A 600 FOOT ACID LINED STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP AND THE STABILIZED SLUD IS DISPOSED OF IN AN OFF SITE MINEFILL. UNIT 1 START UP IS EXPECTED IN OCTOBER 1980.
COLORADO UTE ELECTRIC ASSN CRAIG 2 NEW 455 MW (GROSS) 400 MW (ESC) COAL .45 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 1.5% STATUS 1 STARTUP 12/79	THE CRAIG 2 UNIT OF THE COLORADO UTE ELECTRIC ASSN IS LOCATED IN CRAIG, COLORADO AND FIRES PULVERIZED SUBBITUMINOUS COAL (0.45%S, 10,000 BTU/LB). THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP AND FOUR MAGNESIUM PROMOTED LIMESTONE SPRAY TOWERS FOR REMOVAL OF PARTICULATE MATTER AND 85% OF THE SO2. THE SCRUBBER EXHAUST IS HEATED BY AN IN-LINE STEAM COIL REHEATER AND PASSES THROUGH A 600 FOOT ACID BRICK LINED STACK. THE SYSTEM OPERATES IN A CLOSED LOOP, AND THE STABILIZED SLUDGE IS DISPOSED OF IN AN OFF SITE MINEFILL. START UP OF UNIT 2 WAS IN DECEMBER 1979.
COLORADO UTE ELECTRIC ASSN CRAIG 3 NEW 447 MW (GROSS) 447 MW (ESC) COAL .45 %S SUBBITUMINOUS LIME/SPRAY DRYING BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/82	COLORADO UTE ELECTRIC ASSN. HAS PLANS FOR A NEW UNIT, CRAIG 3, TO BE LOCATED IN CRAIG, COLORADO ALONG WITH UNITS 1 AND 2. THE UNIT WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.45% S, 10,000 BTU/LB). A CONTRACT HAS BEEN AWARDED TO BABCOCK AND WILCOX FOR A DRY SCRUBBING SYSTEM UTILIZING LIME INJECTION. THE UNIT WILL HAVE A FABRIC FILTER FOR PARTICLE CONTROL. THE UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN 1982.
COLUMBUS & SOUTHERN OHIO ELEC CONESVILLE 5 NEW 411 MW (GROSS) 411 MW (ESC) COAL 4.67 %S BITUMINOUS LIME AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 3.9% STATUS 1 STARTUP 1/77	CONESVILLE 5 OF COLUMBUS AND SOUTHERN OHIO ELECTRIC IS A DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4.67% S, 10,850 BTU/LB) FIRED UNIT LOCATED IN CONESVILLE, OHIO. A COLD SIDE ESP RECEIVES 1,393,893 ACFM OF FLUE GAS AND PASSES IT TO TWO THIOSORBIC LIME TCA MODULES SUPPLIED BY UOP. THE SO2 REMOVAL EFFICIENCY OF THE TWO MODULES, WHICH BEGAN INITIAL OPERATION IN JANUARY 1977, IS 89.5% (DESIGN). EACH MODULE HAS ONE BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. THE CLEANED GAS EXITS THROUGH AN 800 FOOT TALL ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE IS PUMPED INTO AN ON SITE DIKED LANDFILL. THE SYSTEM OPERATES IN AN OPEN WATER LOOP.
COLUMBUS & SOUTHERN OHIO ELEC CONESVILLE 6 NEW 411 MW (GROSS) 411 MW (ESC) COAL 4.67 %S BITUMINOUS LIME AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 3.9% STATUS 1 STARTUP 6/78	CONESVILLE 6 OF COLUMBUS AND SOUTHERN OHIO ELECTRIC IS A DRY BOTTOM, PULVERIZED BITUMINOUS COAL (4.67% S, 10,850 BTU/LB) FIRED UNIT LOCATED IN CONESVILLE, OHIO. A COLD SIDE ESP RECEIVES 1,393,893 ACFM OF FLUE GAS AND PASSES IT TO TWO THIOSORBIC LIME TCA MODULES SUPPLIED BY UOP. THE SO2 REMOVAL EFFICIENCY OF THE TWO MODULES, WHICH BEGAN INITIAL OPERATION IN JUNE 1978, IS 89.5% (DESIGN). EACH MODULE HAS ONE BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. THE CLEANED GAS EXITS THROUGH AN 800 FOOT TALL ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE IS PUMPED INTO AN ON SITE DIKED LANDFILL. THE SYSTEM OPERATES IN AN OPEN WATER LOOP.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
COLUMBUS & SOUTHERN OHIO ELEC POSTON 5 NEW 425 MW (GROSS) 375 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 4.7% STATUS 6 STARTUP 8/86	COLUMBUS AND SOUTHERN OHIO ELECTRIC HAS PLANS FOR TWO NEW UNITS, POSTON 5 AND 6, TO BE LOCATED IN ATHENS, OHIO. THE COAL (2.5% S, 11,000 BTU/LB) FIRED UNITS WILL UTILIZE EITHER A LIME, LIMESTONE, OR DUAL ALKALI FGD SYSTEM. START UP OF UNIT 5 IS EXPECTED IN 1986.
COLUMBUS & SOUTHERN OHIO ELEC POSTON 6 NEW 425 MW (GROSS) 375 MW (ESC) COAL 2.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 4.7% STATUS 6 STARTUP 0/89	COLUMBUS AND SOUTHERN OHIO ELECTRIC HAS PLANS FOR TWO NEW UNITS, POSTON 5 AND 6, TO BE LOCATED IN ATHENS, OHIO. THE COAL (2.5% S, 11,000 BTU/LB) FIRED UNITS WILL UTILIZE EITHER A LIME, LIMESTONE, OR DUAL ALKALI FGD SYSTEM. START UP OF UNIT 6 IS EXPECTED IN 1989.
COMMONWEALTH EDISON POWERTON 51 RETROFIT 450 MW (GROSS) 450 MW (ESC) COAL 3.53 %S LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 5.6% STATUS 1 STARTUP 4/80	COMMONWEALTH EDISON HAS RETROFITTED BOILER NUMBER 51 AT ITS POWERTON STATION WITH A UOP LIMESTONE FGD SYSTEM. UNIT 51 IS ONE OF TWO IDENTICAL BOILERS SUPPLYING STEAM TO AN 850 MW TURBINE. THE PULVERIZED COAL (3.53% S, 10,500 BTU/LB) FIRED BOILER FEEDS FLUE GAS THROUGH AN ESP TO 3 TCA MODULES WHICH ARE DESIGNED TO REMOVE 74% OF THE SO2. A STEAM INDIRECT HOT AIR REHEATER BOOSTS THE TEMPERATURE BEFORE THE GAS EXITS AN ACID BRICK LINED STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE SLUDGE IS POZ-O-TEC STABILIZED AND DISPOSED OF IN A LANDFILL. THE FGD SYSTEM COMMENCED OPERATION IN APRIL, 1980.
COOPERATIVE POWER ASSOCIATION COAL CREEK 1 NEW 545 MW (GROSS) 327 MW (ESC) COAL .63 %S LIGNITE LIME/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 7/79	COAL CREEK 1 AND 2 ARE TWO PULVERIZED LIGNITE (0.63% S, 6258 BTU/LB) FIRED UNITS OWNED BY THE COOPERATIVE POWER ASSN AND UNITED POWER. A COLD SIDE ESP RECEIVES 2,200,000 ACFM OF FLUE GAS AND EXHAUSTS IT TO FOUR COUNTER-CURRENT SPRAY TOWERS. MIST ELIMINATION IS PROVIDED BY A BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. A MINIMUM OF 40% BYPASS REHEAT IS PROVIDED BEFORE THE CLEANED GAS EXITS THE 650 FOOT ACID BRICK LINED STACK. THE TOWER DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE FLYASH STABILIZED SLUDGE IS DISPOSED IN A CLAY LINED POND. UNIT 1 OPERATIONS BEGAN IN JULY 1979.
COOPERATIVE POWER ASSOCIATION COAL CREEK 2 NEW 545 MW (GROSS) 327 MW (ESC) COAL .63 %S LIGNITE LIME/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 7/80	COAL CREEK 1 AND 2 ARE TWO PULVERIZED LIGNITE (0.63% S, 6258 BTU/LB) FIRED UNITS OWNED BY THE COOPERATIVE POWER ASSN AND UNITED POWER. A COLD SIDE ESP RECEIVES 2,200,000 ACFM OF FLUE GAS AND EXHAUSTS IT TO FOUR COUNTER-CURRENT SPRAY TOWERS. MIST ELIMINATION IS PROVIDED BY A BULK ENTRAINMENT SEPARATOR AND TWO CHEVRON MIST ELIMINATORS. A MINIMUM OF 40% BYPASS REHEAT IS PROVIDED BEFORE THE CLEANED GAS EXITS THE 650 FOOT ACID BRICK LINED STACK. THE TOWER DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE FLYASH STABILIZED SLUDGE IS DISPOSED OF IN A CLAY LINED POND. UNIT 2 COMMENCED OPERATIONS IN JULY 1980.
DELMARVA POWER & LIGHT DELAWARE CITY 1 RETROFIT 60 MW (GROSS) 60 MW (ESC) COKE 7.00 %S FLUID PETROLEUM COKE WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/80	DELAWARE CITY 1, 2, AND 3 OF DELMARVA POWER AND LIGHT ARE THREE RETRO-FITTED COKE (7-8% S) FIRED BOILERS WHICH HAVE A STEAM CAPACITY OF 500K LB/HR EACH. THE BOILERS GENERATE STEAM AS WELL AS ELECTRICITY FOR GETTY REFINING AND MARKETING. EACH BOILER SUPPLIES 295,000 ACFM OF FLUE GAS TO A MECHANICAL COLLECTOR THEN TO A VENTURI PARTICLE SCRUBBER FOR PARTICULATE CONTROL. THE FLUE GAS THEN PASSES THROUGH A CHEVRON TYPE MIST ELIMINATOR TO A WET ESP FOR BOTH PARTICULATE AND ACID MIST REMOVAL. A FOUR STAGE WELLMAN-LORD SYSTEM, WHICH IS DESIGN FOR 90% REMOVAL, IS USED FOR SO2 CONTROL. HOT AIR INJECTION REHEAT IS USED BEFORE THE GAS EXITS OUT A 500 FT. STACK. THE EMISSION CONTROL SYSTEM IS SUPPLIED BY DAVY MCKEE. IT IS A CLOSED LOOP WATER SYSTEM. THE SYSTEM BECAME OPERATIONAL IN MAY 1980.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
DELMARVA POWER & LIGHT DELAWARE CITY 2 RETROFIT 60 MW (GROSS) 60 MW (ESC) COKE 7.00 %S FLUID PETROLEUM COKE WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/80	DELAWARE CITY 1, 2, AND 3 OF DELMARVA POWER AND LIGHT ARE THREE RETROFITTED COKE (7-8% S) FIRED BOILERS WHICH HAVE A STEAM CAPACITY OF 500K LB/HR EACH. THE BOILERS GENERATE STEAM AS WELL AS ELECTRICITY FOR GETTY REFINING AND MARKETING. EACH BOILER SUPPLIES 295,000 ACFM OF FLUE GAS TO A MECHANICAL COLLECTOR THEN TO A VENTURI PARTICLE SCRUBBER FOR PARTICULATE CONTROL. THE FLUE GAS THEN PASSES THROUGH A CHEVRON TYPE MIST ELIMINATOR TO A WET ESP FOR BOTH PARTICULATE AND ACID MIST REMOVAL. A FOUR STAGE WELLMAN-LORD SYSTEM, WHICH IS DESIGN FOR 90% REMOVAL, IS USED FOR SO2 CONTROL. HOT AIR INJECTION REHEAT IS USED BEFORE THE GAS EXITS OUT A 500 FT. STACK. THE EMISSION CONTROL SYSTEM IS SUPPLIED BY DAVY MCKEE. IT IS A CLOSED LOOP WATER SYSTEM. THE SYSTEM BECAME OPERATIONAL IN MAY 1980.
DELMARVA POWER & LIGHT DELAWARE CITY 3 RETROFIT 60 MW (GROSS) 60 MW (ESC) COKE 7.00 %S FLUID PETROLEUM COKE WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/80	DELAWARE CITY 1, 2, AND 3 OF DELMARVA POWER AND LIGHT ARE THREE RETROFITTED COKE (7-8% S) FIRED BOILERS WHICH HAVE A STEAM CAPACITY OF 500K LB/HR EACH. THE BOILERS GENERATE STEAM AS WELL AS ELECTRICITY FOR GETTY REFINING AND MARKETING. EACH BOILER SUPPLIES 295,000 ACFM OF FLUE GAS TO A MECHANICAL COLLECTOR THEN TO A VENTURI PARTICLE SCRUBBER FOR PARTICULATE CONTROL. THE FLUE GAS THEN PASSES THROUGH A CHEVRON TYPE MIST ELIMINATOR TO A WET ESP FOR BOTH PARTICULATE AND ACID MIST REMOVAL. A FOUR STAGE WELLMAN-LORD SYSTEM, WHICH IS DESIGN FOR 90% REMOVAL, IS USED FOR SO2 CONTROL. HOT AIR INJECTION REHEAT IS USED BEFORE THE GAS EXITS OUT A 500 FT. STACK. THE EMISSION CONTROL SYSTEM IS SUPPLIED BY DAVY MCKEE. IT IS A CLOSED LOOP WATER SYSTEM. THE SYSTEM BECAME OPERATIONAL IN MAY 1980.
DELMARVA POWER & LIGHT VIENNA 9 NEW 550 MW (GROSS) 550 MW (ESC) COAL 2.50 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.7% STATUS 6 STARTUP 6/87	DELMARVA POWER AND LIGHT IS PLANNING A NEW 550 MW (GROSS) UNIT, VIENNA 9, BE CONSTRUCTED IN VIENNA, MARYLAND. THE UTILITY IS PRESENTLY CONSIDERING A LIMESTONE FGD UNIT FOR EMISSION CONTROL. THE PULVERIZED COAL FIRED UNIT WILL BURN COAL WITH AN AVERAGE SULFUR CONTENT OF 2.7% AND IS EXPECTED TO COMMENCE OPERATIONS IN JUNE 1987.
DESERET GEN & TRANS COOP MOON LAKE 1 NEW 410 MW (GROSS) 410 MW (ESC) COAL .50 %S BITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 9/84	MOON LAKE 1 IS A PULVERIZED COAL (0.5% S, 10,500 BTU/LB) FIRED UNIT PLANNED BY DESERET GENERATION AND TRANSMISSION COOP TO BE LOCATED IN VERNAL, UTAH. A CONTRACT WAS AWARDED TO COMBUSTION ENGINEERING FOR A WET LIMESTONE SCRUBBING SYSTEM HAVING A SO2 REMOVAL EFFICIENCY OF 95%. THE SYSTEM WILL FEATURE A BAGHOUSE, SUPPLIED BY ECOLAIRE, TO REMOVE 99.6% OF THE PARTICULATE MATTER. THE UNIT WILL OPERATE IN A CLOSED WATER LOOP WITH SLUDGE DISPOSAL ON SITE IN A LANDFILL. OPERATIONS ARE SCHEDULED TO COMMENCE IN SEPTEMBER 1984.
DESERET GEN & TRANS COOP MOON LAKE 2 NEW 410 MW (GROSS) 410 MW (ESC) COAL .50 %S BITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/88	MOON LAKE 2 IS A PULVERIZED COAL (0.5% S, 10,500 BTU/LB) FIRED UNIT PLANNED BY DESERET GENERATION AND TRANSMISSION COOP TO BE LOCATED IN VERNAL, UTAH. THE UTILITY IS PRESENTLY REQUESTING BIDS FOR A WET LIMESTONE SCRUBBING SYSTEM HAVING A SO2 REMOVAL EFFICIENCY OF 95%. THE SYSTEM WILL FEATURE A BAGHOUSE DESIGNED TO REMOVE 99.6% OF THE PARTICULATE. THE UNIT WILL OPERATE IN A CLOSED WATER LOOP WITH SLUDGE DISPOSAL ON SITE IN A LANDFILL. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1988.
DUQUESNE LIGHT ELRAMA 1-4 RETROFIT 510 MW (GROSS) 510 MW (ESC) COAL 2.20 %S LIME CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: 3.5% STATUS 1 STARTUP 10/75	ELRAMA 1-4 OF DUQUESNE LIGHT CONSISTS OF FOUR PULVERIZED COAL (2.2% S, 11,350 BTU/LB) FIRED UNITS LOCATED IN ELRAMA, PENNSYLVANIA. THE EMISSION CONTROL SYSTEM ON THIS SITE CONSISTS OF AN ESP FOLLOWED BY A MECHANICAL COLLECTOR AND FIVE VARIABLE THROAT VENTURI LIME ABSORBER MODULES SUPPLIED BY CHEMICO, WHICH ARE DESIGNED TO REMOVE 83% OF THE SO2 FROM THE FLUE GAS. THE CLEANED GAS PASSES THROUGH A DIRECT OIL FIRED REHEATER BEFORE EXITING A 400 FOOT ACID BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE POZ-O-TEC STABILIZED SLUDGE IS HAULED TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE OCTOBER 1975.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
DUQUESNE LIGHT PHILLIPS 1-6 RETROFIT 408 MW (GROSS) 408 MW (ESC) COAL 1.92 %S BITUMINOUS LIME CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: 3.4% STATUS 1 STARTUP 7/73	THE PHILLIPS POWER STATION OF DUQUESNE LIGHT CONSISTS OF SIX DRY BOTTOM PULVERIZED COAL (1.92% S, 11,350 BTU/LB) FIRED UNITS LOCATED IN SOUTH HEIGHT, PENNSYLVANIA. PARTICULATE CONTROL IS ACCOMPLISHED BY SIX ESP/MECHANICAL COLLECTOR COMBINATIONS (ONE/BOILER). ONE TWO STAGE AND THREE SINGLE STAGE VARIABLE THROAT VENTURI LIME FGD MODULES SUPPLIED BY CHEMICO ARE DESIGNED TO REMOVE 83% OF THE SO2 FROM THE FLUE GAS. TWO CHEVRON MIST ELIMINATORS/MODULE ARE FOLLOWED BY A DIRECT OIL FIRED REHEATER WHICH RAISES THE GAS TEMPERATURE BY 20 DEG F BEFORE IT LEAVES VIA A 340 FOOT TALL ACID BRICK LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE POZ-O-TEC STABILIZED SLUDGE IS TRUCKED TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE JULY 1973.
EAST KENTUCKY POWER COOP J.K. SMITH 1 NEW 650 MW (GROSS) 650 MW (ESC) COAL 1.50 %S BITUMINOUS PROCESS NOT SELECTED BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 1/85	THE EAST KENTUCKY POWER COOP HAS PLANS TO FIRE TWO NEW UNITS, J.K. SMITH 1 AND 2. A LETTER OF INTENT WAS SIGNED WITH BABCOCK AND WILCOX FOR A WET LIME PROCESS TO CONTROL EMISSIONS. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP FOR UNIT 1 IS EXPECTED IN 1985.
EAST KENTUCKY POWER COOP J.K. SMITH 2 NEW 650 MW (GROSS) 650 MW (ESC) COAL 1.50 %S BITUMINOUS PROCESS NOT SELECTED BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 1/87	THE EAST KENTUCKY POWER COOP HAS PLANS TO FIRE TWO NEW UNITS, J.K. SMITH 1 AND 2. A LETTER OF INTENT WAS SIGNED WITH BABCOCK AND WILCOX FOR A WET LIME PROCESS TO CONTROL EMISSIONS. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. UNIT 2 IS SCHEDULED TO COMMENCE OPERATIONS IN 1987.
EAST KENTUCKY POWER COOP SPURLOCK 2 NEW 500 MW (GROSS) 500 MW (ESC) COAL 3.50 %S LIME COMBUSTION EQUIP ASSOCIATES ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/81	SPURLOCK 2 OF EAST KENTUCKY POWER COOPERATIVE IS A BALANCED DRAFT PULVERIZED COAL (3.5% S, 11,000 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN MAYSVILLE, KENTUCKY. THE EMISSION CONTROL SYSTEM WILL CONSIST OF AN ESP FOLLOWED BY AN ADL/COMBUSTION EQUIPMENT ASSOCIATES LIME FGD SYSTEM (90% DESIGN SO2 REMOVAL EFFICIENCY). FLUE GAS FROM UNIT ONE WILL BE USED TO REHEAT THE CLEANED GAS. THE SYSTEM, SLATED FOR START UP IN OCTOBER 1981, WILL EMPLOY A CLOSED WATER LOOP AND POZ-O-TEC SLUDGE STABILIZATION.
FLORIDA POWER & LIGHT MARTIN 3 NEW 800 MW (GROSS) 800 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/87	FLORIDA POWER AND LIGHT HAS PLANS FOR TWO NEW UNITS, MARTIN 3 AND 4 TO BE LOCATED IN MARTIN COUNTY, FLORIDA. THE PULVERIZED COAL FIRED BOILERS WILL HAVE A MW RATING OF 800 EACH. THE UTILITY IS PRESENTLY CONSIDERING ONLY FGD AS THE EMISSION CONTROL STRATEGY. THE START UP FOR UNIT 3 IS PROJECTED FOR 1987.
FLORIDA POWER & LIGHT MARTIN 4 NEW 800 MW (GROSS) 800 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/89	FLORIDA POWER AND LIGHT HAS PLANS FOR TWO NEW UNITS, MARTIN 3 AND 4 TO BE LOCATED IN MARTIN COUNTY, FLORIDA. THE PULVERIZED COAL FIRED BOILERS WILL HAVE A MW RATING OF 800 EACH. THE UTILITY IS PRESENTLY CONSIDERING ONLY FGD AS THE EMISSION CONTROL STRATEGY. THE START UP FOR UNIT 4 IS PROJECTED FOR 1989.

UNIT IDENTIFICATION	ABSTRACT
GENERAL PUBLIC UTILITIES COAL 1 NEW 625 MW (GROSS) 625 MW (ESC) COAL 3.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 5/91	GENERAL PUBLIC UTILITIES HAS PLANS TO CONSTRUCT A 625 MW UNIT, COAL 1. THE UTILITY IS PRESENTLY REQUESTING/EVALUATING BIDS FOR A FGD SYSTEM TO CONTROL EMISSIONS. THE COAL FIRED (3.5% S) UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN MAY 1991.
GENERAL PUBLIC UTILITIES COAL 2 NEW 625 MW (GROSS) 625 MW (ESC) COAL 3.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 5/93	GENERAL PUBLIC UTILITIES IS PLANNING TO CONSTRUCT A 625 MW UNIT, COAL 2. THE UTILITY IS PRESENTLY CONSIDERING ONLY FGD AS THE EMISSION CONTROL STRATEGY. THE COAL FIRED (3.5% S) UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN 1993.
GENERAL PUBLIC UTILITIES COAL 3 NEW 625 MW (GROSS) 625 MW (ESC) COAL 3.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 5/95	GENERAL PUBLIC UTILITIES IS PLANNING TO CONSTRUCT A 625 MW UNIT, COAL 3. THE UTILITY IS PRESENTLY CONSIDERING ONLY FGD AS THE EMISSION CONTROL STRATEGY. THE COAL FIRED (3.5% S) UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN 1995.
GENERAL PUBLIC UTILITIES COAL 4 NEW 625 MW (GROSS) 625 MW (ESC) COAL 3.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 5/96	GENERAL PUBLIC UTILITIES HAS PLANS TO CONSTRUCT A 625 MW UNIT, COAL 4. THE UTILITY IS PRESENTLY CONSIDERING ONLY FGD AS THE EMISSION CONTROL STRATEGY. THE COAL FIRED (3.5% S) UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN 1996.
GENERAL PUBLIC UTILITIES SEWARD 7 NEW 690 MW (GROSS) 690 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 9.4% STATUS 5 STARTUP 5/89	GENERAL PUBLIC UTILITIES IS PLANNING A NEW UNIT, SEWARD 7, TO BE BUILT IN SEWARD, PENNSYLVANIA. THE UTILITY IS PRESENTLY REQUESTING BIDS FOR AN FGD SYSTEM, WITH NON-SLURRY TYPE LIME AND LIMESTONE SYSTEMS BEING THE PRIMARY CONSIDERATION. START UP IS EXPECTED IN MAY 1989.
GRAND HAVEN BRD OF LIGHT & PWR J.B. SIMS 3 NEW 65 MW (GROSS) 65 MW (ESC) COAL 2.75 %S BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/83	THE GRAND HAVEN BOARD OF LIGHT AND POWER'S J.B. SIMS 3 IS A BITUMINIOUS COAL (2.75% S, 11,000 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN GRAND HAVEN, MICHIGAN. A CONTRACT HAS BEEN AWARDED TO BABCOCK AND WILCOX TO SUPPLY TWO SPRAY TOWERS TO CONTROL SO2 EMISSIONS. EACH SCRUBBER SYSTEM WILL UTILIZE A CHEVRON MIST ELIMINATOR AND AN IN-LINE REHEATER. THE SLUDGE IS TO BE DISPOSED OF IN AN OFF SITE LANDFILL. OPERATIONS ARE TO COMMENCE IN JUNE 1983.

UNIT IDENTIFICATION	ABSTRACT
GULF POWER SCHOLZ 1 RETROFIT 20 MW (GROSS) 20 MW (ESC) COAL 3.25 %S DUAL ALKALI/LIMESTONE COMBUSTION EQUIP ASSOCIATES ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 8/80	THE DUAL ALKALI FGD SYSTEM ORIGINALLY INSTALLED IN 1975-1976 AT THE SCHOLZ STATION OF GULF POWER WAS REACTIVATED IN AUGUST 1980 BY COMBUSTION EQUIPMENT ASSOCIATES AND ARTHUR D. LITTLE. THE SYSTEM IS BEING UTILIZED FOR AN EPA SPONSORED TEST PROGRAM AIMED AT DETERMINING THE FEASIBILITY OF UTILIZING LIMESTONE RATHER THAN LIME AS THE SOURCE OF CALCIUM FOR THE REGENERATION REACTIONS. WITH THE EXCEPTION OF MODIFICATIONS TO THE ORIGINAL ABSORBER VESSELS TO PROMOTE A LONGER RESIDENCE TIME, NO MAJOR EQUIPMENT MODIFICATIONS OR ADDITIONS WERE NECESSARY.
HOOSIER ENERGY MEROM 1 NEW 490 MW (GROSS) 441 MW (ESC) COAL 3.50 %S LIMESTONE MITSUBISHI HEAVY INDUSTRIES ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 5/82	MEROM 1 AND 2 ARE TWO NEW UNITS BEING BUILT BY HOOSIER ENERGY IN SULLIVAN, INDIANA. THESE PULVERIZED COAL (3.5% S) FIRED UNITS WILL PRODUCE 1,732,000 ACFM OF FLUE GAS WHICH WILL BE CLEANED BY A COLD SIDE ESP UPSTREAM OF A MITSUBISHI LIMESTONE GRID TOWER ABSORBER (90% DESIGN SO2 REMOVAL). THE SYSTEM WILL UTILIZE BYPASS REHEAT AND A 700 FOOT STACK. THE SLUDGE WILL BE STABILIZED AND LANDFILLED, AND THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP OF UNIT 1 IS SCHEDULED FOR MAY 1982.
HOOSIER ENERGY MEROM 2 NEW 490 MW (GROSS) 441 MW (ESC) COAL 3.50 %S LIMESTONE MITSUBISHI HEAVY INDUSTRIES ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 9/81	MEROM 1 AND 2 ARE TWO NEW UNITS BEING BUILT BY HOOSIER ENERGY IN SULLIVAN, INDIANA. THESE PULVERIZED COAL (3.5% S) FIRED UNITS WILL PRODUCE 1,732,000 ACFM OF FLUE GAS WHICH WILL BE CLEANED BY A COLD SIDE ESP UPSTREAM OF A MITSUBISHI LIMESTONE GRID TOWER ABSORBER (90% DESIGN SO2 REMOVAL). THE SYSTEM WILL UTILIZE BYPASS REHEAT AND A 700 FOOT STACK. THE SLUDGE WILL BE STABILIZED AND LANDFILLED, AND THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP OF UNIT 2 IS SCHEDULED FOR SEPTEMBER 1981.
HOUSTON LIGHTING & POWER LIMESTONE 1 NEW 750 MW (GROSS) 750 MW (ESC) COAL 1.08 %S LIGNITE LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 12/84	HOUSTON LIGHTING AND POWER CO HAS PLANS FOR TWO NEW UNITS, LIMESTONE 1 AND 2, TO BE LOCATED IN JEWITT, TEXAS. THE PULVERIZED COAL (1.08% S, 6177 BTU/LB) FIRED BOILER WILL UTILIZE A WET LIMESTONE SCRUBBING PROCESS FOR PRIMARY SO2 COLLECTION. A COLD SIDE ESP WILL ALSO BE USED FOR PRIMARY PARTICLE CONTROL. THE UTILITY HAS AWARDED A CONTRACT TO COMBUSTION ENGINEERING FOR THE INSTALLATION OF THIS SYSTEM. UNIT 1 IS SCHEDULED TO COMMENCE OPERATIONS IN 1984.
HOUSTON LIGHTING & POWER LIMESTONE 2 NEW 750 MW (GROSS) 750 MW (ESC) COAL 1.08 %S PULVERIZED COAL LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 12/85	HOUSTON LIGHTING AND POWER CO HAS PLANS FOR TWO NEW UNITS, LIMESTONE 1 AND 2, TO BE LOCATED IN JEWITT, TEXAS. THE PULVERIZED COAL (1.08% S, 6177 BTU/LB) FIRED BOILER WILL UTILIZE A WET LIMESTONE SCRUBBING PROCESS FOR PRIMARY SO2 COLLECTION. A COLD SIDE ESP WILL ALSO BE USED FOR PRIMARY PARTICLE CONTROL. THE UTILITY HAS AWARDED A CONTRACT TO COMBUSTION ENGINEERING FOR THE INSTALLATION OF THIS SYSTEM. UNIT 2 IS SCHEDULED TO COMMENCE OPERATIONS IN 1985.
HOUSTON LIGHTING & POWER W.A. PARISH 8 NEW 600 MW (GROSS) 492 MW (ESC) COAL .60 %S SUBBITUMINOUS LIMESTONE CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 11/82	W.A. PARISH 8 OF HOUSTON LIGHTING & POWER IS A PULVERIZED COAL (0.6% S, 8700 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN THOMPSONS, TEXAS. CHEMICO WILL SUPPLY A LIMESTONE FGD SYSTEM WHICH WILL REMOVE 82% OF THE FLUE GAS SO2. REHEAT WILL BE PROVIDED BY BYPASSING 18% OF THE PARTICULATE CLEANED FLUE GAS. SLUDGE WILL BE DEWATERED, BLENDED WITH FLYASH, AND DISPOSED IN AN ON SITE LANDFILL. OPERATIONS ARE SCHEDULED TO COMMENCE IN NOVEMBER 1982.

UNIT IDENTIFICATION	ABSTRACT
INDIANAPOLIS POWER & LIGHT PATRIOT 1 NEW 650 MW (GROSS) 650 MW (ESC) COAL 3.50 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/87	INDIANAPOLIS POWER AND LIGHT HAS PLANS FOR THREE NEW UNITS, PATRIOT 1, 2, AND 3, TO BE LOCATED IN PATRIOT, INDIANA. THE UTILITY PLANS ON UTILIZING A LIMESTONE FGD PROCESS FOR EMISSION CONTROL.
INDIANAPOLIS POWER & LIGHT PATRIOT 2 NEW 650 MW (GROSS) 650 MW (ESC) COAL 3.50 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/ 0	INDIANAPOLIS POWER AND LIGHT HAS PLANS FOR THREE NEW UNITS, PATRIOT 1, 2, AND 3, TO BE LOCATED IN PATRIOT, INDIANA. THE UTILITY PLANS ON UTILIZING A LIMESTONE FGD PROCESS FOR EMISSION CONTROL.
INDIANAPOLIS POWER & LIGHT PATRIOT 3 NEW 650 MW (GROSS) 650 MW (ESC) COAL 3.50 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/ 0	INDIANAPOLIS POWER AND LIGHT HAS PLANS FOR THREE NEW UNITS, PATRIOT 1, 2, AND 3, TO BE LOCATED IN PATRIOT, INDIANA. THE UTILITY PLANS ON UTILIZING A LIMESTONE FGD PROCESS FOR EMISSION CONTROL.
INDIANAPOLIS POWER & LIGHT PETERSBURG 3 NEW 532 MW (GROSS) 532 MW (ESC) COAL 3.25 %S BITUMINOUS LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 2.4% STATUS 1 STARTUP 12/77	PETERSBURG 3 OF INDIANAPOLIS POWER AND LIGHT IS LOCATED IN PETERSBURG, INDIANA, AND BURNS 3.25% S BITUMINOUS COAL (11,000 BTU/LB). TWO COLD SIDE ESP'S ARE LOCATED UPSTREAM OF 4 85% EFFICIENT UOP LIMESTONE TCA MODULES. A HORIZONTAL MIST ELIMINATOR PRECEDES AN INDIRECT HOT AIR REHEATER THAT BOOSTS THE GAS TEMPERATURE BY 30 DEG F BEFORE IT EXITS THE 616 FOOT RIGI-FLAKE 4850 LINED STACK. STABILIZED SLUDGE IS DISPOSED IN AN ON SITE POND, AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. THIS UNIT HAS BEEN OPERATIONAL SINCE DECEMBER 1977.
INDIANAPOLIS POWER & LIGHT PETERSBURG 4 NEW 530 MW (GROSS) 530 MW (ESC) COAL 3.50 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 2.1% STATUS 2 STARTUP 10/84	PETERSBURG 4 OF INDIANAPOLIS POWER AND LIGHT IS A BITUMINOUS COAL (3.50% S 11,000 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN PETERSBURG, INDIANA. THE LIMESTONE FGD SYSTEM FOR THIS UNIT WILL BE SUPPLIED BY RESEARCH COTTRELL. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND SLUDGE WILL BE POZ-O-TEC STABILIZED BEFORE PONDING. START UP IS SLATED FOR OCTOBER 1984.
IOWA ELECTRIC LIGHT & PWR GUTHRIE CO. 1 NEW 720 MW (GROSS) 720 MW (ESC) COAL .40 %S SUBBITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 11/84	IOWA ELECTRIC LIGHT AND POWER HAS PLANS TO CONSTRUCT A 720 MW UNIT, GUTHRIE COUNTY 1, TO BE LOCATED IN PANORA, IOWA. THE PULVERIZED SUBBITUMINOUS COAL (0.4% S, 8180 BTU/LB) FIRED BOILER WILL UTILIZE A WET LIMESTONE SCRUBBING SYSTEM AND AN ESP FOR EMISSION CONTROL. THE CLEANED FLUE GAS WILL EXIT A 650 FOOT STACK. THE UTILITY STARTED REQUESTING/EVALUATING BIDS IN JANUARY 1980 AND HAS PROJECTED THE STARTUP TO BE IN OCTOBER 1984.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
JACKSONVILLE ELEC AUTHORITY ST.JOHNS RIVER PWR PARK 1 NEW 600 MW (GROSS) 600 MW (ESC) COAL 2.50 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 12/85	THE JACKSONVILLE ELECTRIC AUTHORITY HAS PLANS FOR TWO NEW UNITS, ST. JOHNS RIVER POWER PARK 1 AND 2, TO BE LOCATED IN EAST PORT, FLORIDA. EACH UNIT WILL BURN PULVERIZED COAL (2-4% S) AND SUPPLY 2,660,000 ACFM TO A WET LIMESTONE FGD PROCESS AND AN ESP FOR EMISSION CONTROL. THE CLEANED FLUE GAS IS TO EXIT A 285 FOOT STACK. UNIT 1 IS SCHEDULED TO COMMENCE OPERATIONS IN 1985.
JACKSONVILLE ELEC AUTHORITY ST.JOHNS RIVER PWR PARK 2 NEW 600 MW (GROSS) 600 MW (ESC) COAL 2.50 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/87	THE JACKSONVILLE ELECTRIC AUTHORITY HAS PLANS FOR TWO NEW UNITS, ST. JOHNS RIVER POWER PARK 1 AND 2, TO BE LOCATED IN EAST PORT, FLORIDA. EACH UNIT WILL BURN PULVERIZED COAL (2-4% S) AND SUPPLY 2,660,000 ACFM TO A WET LIMESTONE FGD PROCESS AND AN ESP FOR EMISSION CONTROL. THE CLEANED FLUE GAS IS TO EXIT A 285 FOOT STACK. UNIT 2 IS SCHEDULED TO COMMENCE OPERATIONS IN 1987.
KANSAS CITY POWER & LIGHT HAWTHORN 3 RETROFIT 90 MW (GROSS) 90 MW (ESC) COAL .60 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.2% STATUS 1 STARTUP 11/72	HAWTHORN 3 OF KANSAS CITY POWER AND LIGHT IS A DRY BOTTOM PULVERIZED BITUMINOUS COAL (0.6% S, 9800 BTU/LB) FIRED UNIT LOCATED IN KANSAS CITY, MISSOURI, WHICH WAS CONVERTED FROM LIMESTONE FURNACE INJECTION AND TAIL END SCRUBBING TO A LIME SLURRY SYSTEM. TWO COMBUSTION ENGINEERING MARBLE BED ABSORBERS, WHICH WERE DESIGNED TO REMOVE 70% OF THE FLUE GAS SO2, BEGAN OPERATION IN JANUARY 1977. ONE HORIZONTAL CHEVRON MIST ELIMINATOR PER MODULE IS UPSTREAM OF AN IN-LINE FINNED TUBE REHEATER, WHICH RAISES THE TEMPERATURE OF THE CLEANED GAS BEFORE IT EXITS THROUGH A GUNITE LINED 200 FOOT STACK. THE FLYASH STABILIZED SLUDGE IS DEPOSITED IN AN UNLINED SLUDGE POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE.
KANSAS CITY POWER & LIGHT HAWTHORN 4 RETROFIT 90 MW (GROSS) 90 MW (ESC) COAL .60 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.2% STATUS 1 STARTUP 8/72	HAWTHORN 4 OF KANSAS CITY POWER AND LIGHT IS A DRY BOTTOM PULVERIZED BITUMINOUS COAL (0.6% S, 9800 BTU/LB) FIRED UNIT LOCATED IN KANSAS CITY, MISSOURI, WHICH WAS CONVERTED FROM LIMESTONE FURNACE INJECTION AND TAIL END SCRUBBING TO A LIME SLURRY SYSTEM. TWO COMBUSTION ENGINEERING MARBLE BED ABSORBERS, WHICH WERE DESIGNED TO REMOVE 70% OF THE FLUE GAS SO2, BEGAN OPERATION IN JANUARY 1977. ONE HORIZONTAL CHEVRON MIST ELIMINATOR PER MODULE IS UPSTREAM OF AN IN-LINE FINNED TUBE REHEATER, WHICH RAISES THE TEMPERATURE OF THE CLEANED GAS BEFORE IT EXITS THROUGH A GUNITE LINED 200 FOOT STACK. THE FLYASH STABILIZED SLUDGE IS DEPOSITED IN AN UNLINED SLUDGE POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE.
KANSAS CITY POWER & LIGHT LA CYGNE 1 NEW 820 MW (GROSS) 820 MW (ESC) COAL 5.39 %S SUBBITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 2.9% STATUS 1 STARTUP 2/73	LA CYGNE 1 IS A WET BOTTOM, CYCLONE FIRED PULVERIZED SUBBITUMINOUS COAL (5.39% S, 9421 BTU/LB) FIRED UNIT OF KANSAS CITY POWER AND LIGHT, LOCATED IN LA CYGNE, KANSAS. THE EMISSION CONTROL SYSTEM CONSISTS OF EIGHT VARIABLE THROAT VENTURI/LIMESTONE SIEVE TRAY TOWER TRAINS SUPPLIED BY BABCOCK AND WILCOX. EACH 80% (SO2 REMOVAL, DESIGN) EFFICIENT TRAIN IS FOLLOWED BY A COMBINATION SIEVE TRAY AND CHEVRON MIST ELIMINATOR, FOLLOWED BY AN INDIRECT REHEATER. THE CLEANED GAS EXITS THROUGH A 700 FOOT STEEL LINED STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE SCRUBBER SLUDGE IS DISPOSED IN AN UNLINED POND. INITIAL OPERATIONS OF THE FGD SYSTEM BEGAN IN FEBRUARY 1973.
KANSAS POWER & LIGHT JEFFREY 1 NEW 720 MW (GROSS) 540 MW (ESC) COAL .32 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 8/78	KANSAS CITY POWER AND LIGHT'S JEFFREY 1 IS A TANGENTIAL FIRED PULVERIZED COAL (0.32% S, 8125 BTU/LB) UNIT IN WAMEGO, KANSAS. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A COLD SIDE ESP FOLLOWED BY SIX (ONE SPARE) LIMESTONE SPRAY TOWER MODULES SUPPLIED BY COMBUSTION ENGINEERING. THE DESIGN SO2 REMOVAL EFFICIENCY IS 50% (INCLUDING A 30% BYPASS REHEAT). THE UNIT HAS BEEN OPERATIONAL SINCE AUGUST 1978.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
KANSAS POWER & LIGHT JEFFREY 2 NEW 700 MW (GROSS) 490 MW (ESC) COAL .30 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/80	UNIT 2, PRESENTLY OPERATING AT KANSAS POWER AND LIGHT'S JEFFREY ENERGY CENTER IN JEFFREY, KANSAS, BURNS 0.3% S PULVERIZED COAL (8100 BTU/LB). THIS UNIT'S EMISSION CONTROL SYSTEM CONSISTS OF A COLD SIDE ESP AND COMBUSTION ENGINEERING LIMESTONE SPRAY TOWERS. A 30% FLUE GAS BYPASS PROVIDES REHEAT OF THE CLEANED GAS BEFORE IT EXITS THROUGH A 600 FOOT STACK. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE, AND THE SLUDGE IS STABILIZED WITH BOTTOM ASH AND PIPED TO AN ON-SITE CLAY LINED POND. INITIAL OPERATIONS COMMENCED IN APRIL 1980.
KANSAS POWER & LIGHT LAWRENCE 4 RETROFIT 125 MW (GROSS) 125 MW (ESC) COAL .55 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 1/77	LAWRENCE 4 OF KANSAS POWER AND LIGHT IS A BALANCED DRAFT, TANGENTIAL FIRED PULVERIZED COAL (0.55% S, 10,000 BTU/LB) UNIT LOCATED IN LAWRENCE, KANSAS. A NEW COMBUSTION ENGINEERING LIMESTONE ROD DECK/SPRAY TOWER SYSTEM REPLACED THE EXISTING MARBLE BED TAIL END SCRUBBER IN JANUARY 1977. THE SYSTEM TREATS 403,000 ACFM OF FLUE GAS, WITH A DESIGN SO2 REMOVAL OF 73%. MIST ELIMINATION IS ACCOMPLISHED BY TWO CHEVRONS AND ONE BULK ENTRAINMENT SEPARATOR FOLLOWING EACH OF THE TWO MODULES. A FINNED TUBE REHEATER BOOSTS THE TEMPERATURE OF THE CLEANED GAS BY 20 DEG F BEFORE IT IS EXHAUSTED THROUGH A 120 FOOT STACK. THE SLUDGE IS DISPOSED IN AN UNLINED INTERIM POND, WHICH OVERFLOWS INTO A FINAL DISPOSAL POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP.
KANSAS POWER & LIGHT LAWRENCE 5 RETROFIT 420 MW (GROSS) 420 MW (ESC) COAL .55 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/78	LAWRENCE 5 OF KANSAS POWER AND LIGHT IS A BALANCED DRAFT, TANGENTIAL FIRED PULVERIZED COAL (0.55% S, 10,000 BTU/LB) UNIT LOCATED IN LAWRENCE, KANSAS. A NEW COMBUSTION ENGINEERING LIMESTONE ROD DECK/SPRAY TOWER SYSTEM REPLACED THE EXISTING MARBLE BED TAIL END SCRUBBER IN APRIL 1978. THE SYSTEM TREATS 403,000 ACFM OF FLUE GAS, WITH A DESIGN SO2 REMOVAL OF 73%. MIST ELIMINATION IS ACCOMPLISHED BY TWO CHEVRONS AND ONE BULK ENTRAINMENT SEPARATOR FOLLOWING EACH OF THE TWO MODULES. A FINNED TUBE REHEATER BOOSTS THE TEMPERATURE OF THE CLEANED GAS BY 20 DEG F BEFORE IT IS EXHAUSTED THROUGH A 120 FOOT STACK. THE SLUDGE IS DISPOSED IN AN UNLINED INTERIM POND, WHICH OVERFLOWS INTO A FINAL DISPOSAL POND. THE SYSTEM OPERATES IN A CLOSED WATER LOOP.
KENTUCKY UTILITIES GREEN RIVER 1-3 RETROFIT 64 MW (GROSS) 64 MW (ESC) COAL 4.00 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 9/75	GREEN RIVER 1-3 OF KENTUCKY UTILITIES ARE THREE DRY BOTTOM PULVERIZED BITUMINOUS COAL (4% S, 11,000 BTU/LB) FIRED UNITS LOCATED IN CENTRAL CITY, KENTUCKY. EACH BOILER SUPPLIES 360,000 ACFM OF FLUE GAS TO A VARIABLE THROAT VENTURI FOLLOWED BY AN AMERICAN AIR FILTER LIME MOBILE BED CONTACTOR (80% DESIGN SO2 REMOVAL EFFICIENCY). A RADIAL VANE MIST ELIMINATOR IS FOLLOWED BY A STEAM TUBE REHEATER AND A 165 FOOT STACK. SLUDGE IS DISPOSED IN AN ON-SITE UNLINED POND, AND THE SYSTEM OPERATES IN A CLOSED WATER LOOP. THE SYSTEM HAS BEEN OPERATIONAL SINCE SEPTEMBER 1975.
KENTUCKY UTILITIES HANCOCK 1 NEW 708 MW (GROSS) 650 MW (ESC) COAL 3.50 %S BITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/88	KENTUCKY UTILITIES HAS PLANS TO CONSTRUCT TWO NEW 650 MW (NET) PULVERIZED COAL (3.5% S, 10,500 BTU/LB) FIRED BOILERS. THE UNITS, HANCOCK 1 AND 2, ARE TO BE LOCATED IN HAWESVILLE, KENTUCKY. THE UTILITY IS CONSIDERING A WET LIMESTONE SCRUBBING SYSTEM WHICH WILL OPERATE IN A CLOSED WATER LOOP MODE TO CONTROL EMISSIONS. HANCOCK 1 AND 2 ARE SCHEDULED TO COMMENCE OPERATION IN 1988 AND 1994, RESPECTFULLY.
KENTUCKY UTILITIES HANCOCK 2 NEW 708 MW (GROSS) 650 MW (ESC) COAL 3.50 %S BITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/94	KENTUCKY UTILITIES HAS PLANS TO CONSTRUCT TWO NEW 650 MW (NET) PULVERIZED COAL (3.5% S, 10,500 BTU/LB) FIRED BOILERS. THE UNITS, HANCOCK 1 AND 2, ARE TO BE LOCATED IN HAWESVILLE, KENTUCKY. THE UTILITY IS CONSIDERING A WET LIMESTONE SCRUBBING SYSTEM WHICH WILL OPERATE IN A CLOSED WATER LOOP MODE TO CONTROL EMISSIONS. HANCOCK 1 AND 2 ARE SCHEDULED TO COMMENCE OPERATION IN 1988 AND 1994, RESPECTFULLY.

UNIT IDENTIFICATION	ABSTRACT
LAKELAND UTILITIES MCINTOSH 3 NEW 364 MW (GROSS) 364 MW (ESC) COAL 2.56 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 8/81	MCINTOSH 3 OF LAKELAND UTILITIES IS BEING CONSTRUCTED IN LAKELAND, FLORIDA. BABCOCK AND WILCOX HAS BEEN AWARDED A CONTRACT TO SUPPLY AN 85% EFFICIENT (SO2) LIMESTONE FGD SYSTEM FOR THIS UNIT. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A COLD SIDE ESP FOLLOWED BY TWO PARALLEL FGD MODULES AND A 250 FOOT ACID BRICK LINED STACK. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP, AND THE POZ-O-TEC STABILIZED SLUDGE WILL BE USED AS A CONSTRUCTION BASE. CONSTRUCTION BEGAN IN NOVEMBER 1979 AND START UP IS SCHEDULED TO BE IN AUGUST 1981.
LANSING BOARD OF WATER & LIGHT ERICKSON 2 NEW 160 MW (GROSS) 160 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 1/87	THE ERICKSON 2 STATION OF THE LANSING BOARD OF WATER AND LIGHT IS A PLANNED UNIT TO BE LOCATED IN DELTA TOWNSHIP, MICHIGAN. THE UNIT WILL HAVE A MW RATING OF BETWEEN 160 AND 250, DEPENDING ON WHETHER OTHER MUNICIPALITIES WILL JOIN IN THIS PROJECT. THE UTILITY IS PRESENTLY CONSIDERING THE USE OF FGD FOR EMISSION CONTROL. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1987.
LOS ANGELES DEPT OF WTR & PWR INTERMOUNTAIN 1 NEW 820 MW (GROSS) 820 MW (ESC) COAL .79 %S SUBBITUMINOUS LIME VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/86	THE LOS ANGELES DEPARTMENT OF WATER AND POWER HAS PLANS FOR FOUR NEW BOILERS, INTERMOUNTAIN 1, 2, 3 AND 4, TO BE LOCATED IN DELTA, UTAH. EACH 820 MW BOILER WILL FIRE PULVERIZED COAL (0.79% S, 10,200 BTU/LB) AND WILL SUPPLY 5,400,000 ACFM OF FLUE GAS TO A WET LIME SCRUBBING SYSTEM. A HORIZONTAL WEIR TYPE SCRUBBER ALONG WITH A HOT SIDE ESP IS UNDER CONSIDERATION BY THE UTILITY FOR EMISSION CONTROL. THE CLEANED FLUE GAS WILL EXIT A 750 FOOT STACK. UNIT 1 IS SCHEDULED TO COMMENCE OPERATIONS IN 1986.
LOS ANGELES DEPT OF WTR & PWR INTERMOUNTAIN 2 NEW 820 MW (GROSS) 820 MW (ESC) COAL .79 %S SUBBITUMINOUS LIME VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/87	THE LOS ANGELES DEPARTMENT OF WATER AND POWER HAS PLANS FOR FOUR NEW BOILERS, INTERMOUNTAIN 1, 2, 3 AND 4, TO BE LOCATED IN DELTA, UTAH. EACH 820 MW BOILER WILL FIRE PULVERIZED COAL (0.79% S, 10,200 BTU/LB) AND WILL SUPPLY 5,400,000 ACFM OF FLUE GAS TO A WET LIME SCRUBBING SYSTEM. A HORIZONTAL WEIR TYPE SCRUBBER ALONG WITH A HOT SIDE ESP IS UNDER CONSIDERATION BY THE UTILITY FOR EMISSION CONTROL. THE CLEANED FLUE GAS WILL EXIT A 750 FOOT STACK. UNIT 2 IS SCHEDULED TO COMMENCE OPERATIONS IN 1987.
LOS ANGELES DEPT OF WTR & PWR INTERMOUNTAIN 3 NEW 820 MW (GROSS) 820 MW (ESC) COAL .79 %S SUBBITUMINOUS LIME VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/88	THE LOS ANGELES DEPARTMENT OF WATER AND POWER HAS PLANS FOR FOUR NEW BOILERS, INTERMOUNTAIN 1, 2, 3 AND 4, TO BE LOCATED IN DELTA, UTAH. EACH 820 MW BOILER WILL FIRE PULVERIZED COAL (0.79% S, 10,200 BTU/LB) AND WILL SUPPLY 5,400,000 ACFM OF FLUE GAS TO A WET LIME SCRUBBING SYSTEM. A HORIZONTAL WEIR TYPE SCRUBBER ALONG WITH A HOT SIDE ESP IS UNDER CONSIDERATION BY THE UTILITY FOR EMISSION CONTROL. THE CLEANED FLUE GAS WILL EXIT A 750 FOOT STACK. UNIT 3 IS SCHEDULED TO COMMENCE OPERATIONS IN 1988.
LOS ANGELES DEPT OF WTR & PWR INTERMOUNTAIN 4 NEW 820 MW (GROSS) 820 MW (ESC) COAL .79 %S SUBBITUMINOUS LIME VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/89	THE LOS ANGELES DEPARTMENT OF WATER AND POWER HAS PLANS FOR FOUR NEW BOILERS, INTERMOUNTAIN 1, 2, 3 AND 4, TO BE LOCATED IN DELTA, UTAH. EACH 820 MW BOILER WILL FIRE PULVERIZED COAL (0.79% S, 10,200 BTU/LB) AND WILL SUPPLY 5,400,000 ACFM OF FLUE GAS TO A WET LIME SCRUBBING SYSTEM. A HORIZONTAL WEIR TYPE SCRUBBER ALONG WITH A HOT SIDE ESP IS UNDER CONSIDERATION BY THE UTILITY FOR EMISSION CONTROL. THE CLEANED FLUE GAS WILL EXIT A 750 FOOT STACK. UNIT 4 IS SCHEDULED TO COMMENCE OPERATIONS IN 1989.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
LOUISVILLE GAS & ELECTRIC CANE RUN 4 RETROFIT 188 MW (GROSS) 188 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 8/76	UNIT 4 AT LOUISVILLE GAS AND ELECTRIC'S CANE RUN STATION IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. AN ESP AND TWO AMERICAN AIR FILTER CARBIDE LIME MOBILE BED ABSORBER MODULES (85% DESIGN SO2 REMOVAL) TREAT 734,000 ACFM OF FLUE GAS FROM THE BOILER. TWO CHEVRON MIST ELIMINATORS/MODULE ARE FOLLOWED BY A DIRECT COMBUSTION REHEATER AND A 250 FOOT STACK. THE WATER LOOP IS OPEN, AND THE SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THIS RETROFIT SYSTEM HAS BEEN OPERATIONAL SINCE AUGUST 1976.
LOUISVILLE GAS & ELECTRIC CANE RUN 5 RETROFIT 200 MW (GROSS) 200 MW (ESC) COAL 3.75 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.5% STATUS 1 STARTUP 12/77	CANE RUN 5 OF LOUISVILLE GAS AND ELECTRIC IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT LOCATED IN LOUISVILLE, KENTUCKY. THE BOILER SUPPLIES 700,000 ACFM OF FLUE GAS TO AN EMISSION CONTROL SYSTEM CONSISTING OF AN ESP FOLLOWED AND TWO COMBUSTION ENGINEERING 85% EFFICIENT (DESIGN) CARBIDE LIME SPRAY TOWERS. A STEAM TUBE REHEATER RAISES THE GAS TEMPERATURE 40 DEG F. THE SYSTEM OPERATES IN AN OPEN WATER LOOP MODE, AND THE SLUDGE IS POZ-O-TEC STABILIZED. OPERATION OF THIS RETROFIT SYSTEM BEGAN IN DECEMBER 1977.
LOUISVILLE GAS & ELECTRIC CANE RUN 6 RETROFIT 299 MW (GROSS) 299 MW (ESC) COAL 4.80 %S BITUMINOUS DUAL ALKALI COMBUSTION EQUIP ASSOCIATES ENERGY CONSUMPTION: 1.0% STATUS 1 STARTUP 4/79	LOUISVILLE GAS AND ELECTRIC'S CANE RUN 6 IS A PULVERIZED BITUMINOUS COAL (4.80% S, 11,500 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. ADL/COMBUSTION EQUIPMENT ASSOCIATES SUPPLIED A RETROFIT DUAL ALKALI DEMONSTRATION FGD SYSTEM FOR THIS UNIT. THE EMISSION CONTROL SYSTEM, DESIGNED TO REMOVE 95% OF THE FLUE GAS SO2, CONSISTS OF A COLD SIDE ESP AND TWO TRAY TOWER MODULES. THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR AND TWO DIRECT COMBUSTION REHEATERS BEFORE EXITING A 518 FOOT STACK. THE WATER LOOP IS OPEN, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED POND. FOR A ONE YEAR PERIOD FOLLOWING THE FIRST QUARTER OF OPERATION (WHICH BEGAN IN APRIL 1979), THE U.S.EPA WILL SUBSIDIZE A MAX OF $4.5 MM FOR OPERATION, R&D, AND REPORT WRITING (NOT APPLIED TO ANY CAPITAL EXPENDITURES).
LOUISVILLE GAS & ELECTRIC MILL CREEK 1 RETROFIT 358 MW (GROSS) 358 MW (ESC) COAL 3.75 %S LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.4% STATUS 1 STARTUP 12/80	MILL CREEK 1 OF LOUISVILLE GAS AND ELECTRIC IS LOCATED IN LOUISVILLE, KENTUCKY. A RETROFIT LIME/LIMESTONE FGD SYSTEM IS PRESENTLY OPERATING ON THIS PULVERIZED COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT. COMBUSTION ENGINEERING SUPPLIED THE LIME/LIMESTONE FGD SYSTEM WHICH IS SCHEDULED TO COMPLY WITH LOCAL EMISSION STANDARDS BY APRIL 1981.
LOUISVILLE GAS & ELECTRIC MILL CREEK 2 RETROFIT 350 MW (GROSS) 350 MW (ESC) COAL 3.75 %S LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.4% STATUS 2 STARTUP 12/81	MILL CREEK 2 OF LOUISVILLE GAS AND ELECTRIC IS LOCATED IN LOUISVILLE, KENTUCKY. A RETROFIT LIME/LIMESTONE FGD SYSTEM IS PRESENTLY UNDER CONSTRUCTION ON THIS PULVERIZED COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT. COMBUSTION ENGINEERING IS SUPPLYING THE LIME FGD SYSTEM WHICH WILL COMPLY WITH LOCAL EMISSION STANDARDS BY APRIL 1982.
LOUISVILLE GAS & ELECTRIC MILL CREEK 3 NEW 442 MW (GROSS) 442 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 8/78	LOUISVILLE GAS AND ELECTRIC'S MILL CREEK 3 IS A 3.75% S COAL (11,500 BTU/LB) FIRED UNIT LOCATED IN LOUISVILLE, KENTUCKY. AMERICAN AIR FILTER SUPPLIED A CARBIDE LIME FGD SYSTEM FOR THIS UNIT WHICH WAS DESIGNED TO REMOVE 85% OF THE SO2 FROM THE FLUE GAS. AN ESP IS FOLLOWED BY FOUR MOBILE BED SPRAY TOWERS AND A STEAM TUBE REHEATER. THE WATER LOOP IS OPEN, AND THE FLYASH AND LIME STABILIZED SLUDGE IS PONDED. THIS UNIT HAS BEEN OPERATIONAL SINCE AUGUST 1978.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
LOUISVILLE GAS & ELECTRIC MILL CREEK 4 NEW 530 MW (GROSS) 495 MW (ESC) COAL 3.75 %S LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/82	MILL CREEK 4 OF LOUISVILLE GAS AND ELECTRIC IS A PULVERIZED BITUMINOUS COAL (3.75% S, 11,500 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN LOUISVILLE, KENTUCKY. THE EMISSION CONTROL SYSTEM WILL CONSIST OF AN ESP AND FOUR MOBILE BED SPRAY TOWERS. THE SYSTEM'S WATER LOOP WILL BE CLOSED, AND THE SLUDGE WILL BE STABILIZED WITH LIME AND FLYASH. STEAM TUBES WILL PROVIDE REHEAT OF THE CLEANED GASES. THE SYSTEM IS SCHEDULED TO START UP IN JUNE 1982.
LOUISVILLE GAS & ELECTRIC PADDY'S RUN 6 RETROFIT 72 MW (GROSS) 72 MW (ESC) COAL 2.50 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.8% STATUS 1 STARTUP 4/73	UNIT 6 AT LOUISVILLE GAS AND ELECTRIC'S PADDY'S RUN STATION IS A DRY BOTTOM PULVERIZED COAL (2.5% S, 11,500 BTU/LB) FIRED UNIT IN LOUISVILLE, KENTUCKY. A RETROFIT CARBIDE LIME FGD SYSTEM BY COMBUSTION ENGINEERING TREATS 400,000 ACFM OF FLUE GAS FROM THE BOILER. AN ESP IS FOLLOWED BY TWO MARBLE BED ABSORBERS, A DIRECT COMBUSTION REHEATER, AND A 250 FOOT STACK. MIST ELIMINATION IS PROVIDED BY ONE CHEVRON/MODULE. THE LIME FIXATED SLUDGE IS TRUCKED TO AN UNLINED POND, AND THE WATER LOOP IS CLOSED. THE FGD SYSTEM BEGAN INITIAL OPERATIONS IN APRIL 1973.
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY 1 NEW 575 MW (GROSS) 575 MW (ESC) COAL 4.00 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 7/85	LOUISVILLE GAS AND ELECTRIC WILL BE INSTALLING FGD SYSTEMS ON TWO OF THE FOUR BOILERS AT THE UTILITY'S PLANNED TRIMBLE COUNTY STATION IN BEDFORD, KENTUCKY. THE PULVERIZED 4% S (IF NO COAL WASH IS INCLUDED) COAL FIRED UNITS' FLUE GAS WILL BE CLEANED BY ESP'S AND WET SCRUBBING (90% REMOVAL EFFICIENCY). SLUDGE DISPOSAL STRATEGY IS UNDECIDED. UNIT 1 IS SCHEDULED FOR START UP IN JULY 1985.
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY 2 NEW 575 MW (GROSS) 575 MW (ESC) COAL 4.00 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 7/88	LOUISVILLE GAS AND ELECTRIC WILL BE INSTALLING FGD SYSTEMS ON TWO OF THE FOUR BOILERS AT THE UTILITY'S PLANNED TRIMBLE COUNTY STATION IN BEDFORD, KENTUCKY. THE PULVERIZED 4% S (IF NO COAL WASH IS INCLUDED) COAL FIRED UNITS' FLUE GAS WILL BE CLEANED BY ESP'S AND WET SCRUBBING (90% REMOVAL EFFICIENCY). SLUDGE DISPOSAL STRATEGY IS UNDECIDED. UNIT 2 IS SCHEDULED FOR START UP IN 1988.
LOWER COLORADO RIVER AUTH FAYETTE POWER PROJECT 3 NEW 435 MW (GROSS) 435 MW (ESC) LIGNITE 1.70 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.8% STATUS 6 STARTUP 0/88	LOWER COLORADO RIVER AUTHORITY HAS PLANS TO CONSTRUCT A 435 MW UNIT, FAYETTE POWER PROJECT 3, TO BE LOCATED IN LA GRANGE, TEXAS. THE LIGNITE (1.7% S, 4300 BTU/LB) FIRED BOILER WILL UTILIZE A FGD SYSTEM DESIGNED TO REMOVE 90% SO2. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1988.
MARQUETTE BOARD OF LIGHT & PWR SHIRAS 3 NEW 44 MW (GROSS) 31 MW (ESC) COAL ***** %S LIME BUELL DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 10/82	SHIRAS 3 OF THE MARQUETTE BOARD OF LIGHT AND POWER IS A PULVERIZED COAL FIRED BOILER PLANNED FOR LOCATION IN MARQUETTE, MICHIGAN. THE UTILITY HAS AWARDED A CONTRACT TO BUELL DIVISION, ENVIROTECH FOR A LIME/SPRAY DRYING PROCESS TO CONTROL EMISSIONS. THE SYSTEM WILL UTILIZE A FABRIC FILTER TO OBTAIN A PARTICLE REMOVAL EFFICIENCY OF 99.8%. THE UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN OCTOBER 1982.

UNIT IDENTIFICATION	ABSTRACT
MICHIGAN SO CENTRAL PWR AGENCY PROJECT 1 NEW 55 MW (GROSS) 55 MW (ESC) COAL 2.25 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 1.8% STATUS 2 STARTUP 6/82	THE PROJECT 1 UNIT OF MICHICAN SOUTH CENTRAL POWER AGENCY IS UNDER CONSTRUCTION IN LITCHFIELD, MICHIGAN, AND WILL UTILIZE A WET LIMESTONE FGD PROCESS. THE PULVERIZED COAL FIRED BOILER WILL FEED ITS FLUE GAS THROUGH A HOT SIDE ESP FOLLOWED BY A BABCOCK AND WILCOX LIMESTONE SPRAY TOWER. THE CLEANED GAS WILL PASS THROUGH A MIST ELIMINATOR BEFORE BEING WARMED BY AN IN-LINE REHEATER AND EXITING A 250 FOOT STACK. THE SLUDGE IS TO BE DISPOSED OFF SITE. START UP IS SCHEDULED FOR JUNE 1982.
MIDDLE SOUTH UTILITIES ARKANSAS LIGNITE 5 NEW 890 MW (GROSS) 890 MW (ESC) COAL .50 %S LIGNITE PROCESS NOT SELECTED COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 0/90	UNIT 1 OF THE ARKANSAS ENERGY LIGNITE CENTER IS A LIGNITE (.5% S) FIRED BOILER. MIDDLE SOUTH UTILITIES HAS SIGNED A LETTER OF INTENT WITH COMBUSTION ENGINEERING FOR A WET LIMESTONE SCRUBBING SYSTEM TO CONTROL EMISSIONS. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1990.
MIDDLE SOUTH UTILITIES ARKANSAS LIGNITE 6 NEW 890 MW (GROSS) 890 MW (ESC) COAL .50 %S LIGNITE PROCESS NOT SELECTED COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 0/92	UNIT 2 OF THE ARKANSAS ENERGY LIGNITE CENTER IS A LIGNITE (.5% S) FIRED BOILER. MIDDLE SOUTH UTILITIES HAS SIGNED A LETTER OF INTENT WITH COMBUSTION ENGINEERING FOR A WET LIMESTONE SCRUBBING SYSTEM TO CONTROL EMISSIONS. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1992.
MIDDLE SOUTH UTILITIES UNASSIGNED 1 NEW 890 MW (GROSS) 890 MW (ESC) COAL .50 %S PROCESS NOT SELECTED COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 0/89	MIDDLE SOUTH UTILITIES HAS SIGNED A LETTER OF INTENT WITH COMBUSTION ENGINEERING FOR A WET LIMESTONE SCRUBBING SYSTEM TO CONTROL EMISSIONS. THE PLANT NAME HAS NOT BEEN ASSIGNED. THE PLANT WILL BE LOCATED SOMEWHERE IN LOUISIANA. STARTUP IS SCHEDULED FOR 1989.
MIDDLE SOUTH UTILITIES UNASSIGNED 2 NEW 890 MW (GROSS) 890 MW (ESC) COAL .50 %S PROCESS NOT SELECTED COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 0/93	MIDDLE SOUTH UTILITIES HAS SIGNED A LETTER OF INTENT WITH COMBUSTION ENGINEERING FOR A WET LIMESTONE SCRUBBING SYSTEM TO CONTROL EMISSIONS. THE PLANT NAME HAS NOT BEEN ASSIGNED. THE PLANT WILL BE LOCATED SOMEWHERE IN LOUISIANA. STARTUP IS SCHEDULED FOR 1993.
MIDDLE SOUTH UTILITIES WILTON 1 NEW 890 MW (GROSS) 890 MW (ESC) COAL .50 %S PROCESS NOT SELECTED COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 0/88	WILTON 1 IS A COAL (.50% S) FIRED BOILER TO BE LOCATED IN CONVENT, LOUISIANA. MIDDLE SOUTH UTILITIES HAS SIGNED A LETTER OF INTENT WITH COMBUSTION ENGINEERING FOR A WET LIMESTONE SCRUBBING SYSTEM FOR EMISSION CONTROL. STARTUP IS SCHEDULED FOR 1988.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
MIDDLE SOUTH UTILITIES WILTON 2 NEW 890 MW (GROSS) 890 MW (ESC) COAL .50 %S PROCESS NOT SELECTED COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 0/91	WILTON 2 IS A COAL (.50% S) FIRED BOILER TO BE LOCATED IN CONVENT, LOUISIANA. MIDDLE SOUTH UTILITIES HAS SIGNED A LETTER OF INTENT WITH COMBUSTION ENGINEERING FOR A WET LIMESTONE SCRUBBING SYSTEM FOR EMISSION CONTROL. STARTUP IS SCHEDULED FOR 1991.
MINNESOTA POWER & LIGHT CLAY BOSWELL 4 NEW 554 MW (GROSS) 475 MW (ESC) COAL .94 %S SUBBITUMINOUS LIME/ALKALINE FLYASH PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 4/80	CLAY BOSWELL 4 OF MINNESOTA POWER AND LIGHT IS A SUBBITUMINOUS COAL (0.94% S, 8896 BTU/LB) FIRED UNIT LOCATED IN COHASSET, MINNESOTA. PEABODY PROCESS SYSTEMS HAS SUPPLIED A LIME/ALKALINE FLYASH SYSTEM WHICH IS DESIGNED TO REMOVE 84.6% OF THE SO2 IN THE FLUE GAS. TWO HOT SIDE ESP'S ARE FOLLOWED BY VENTURI/SPRAY TOWER TRAINS. MIST ELIMINATION IS PROVIDED BY A SIEVE TRAY FOLLOWED BY A SPIN VANE CHEVRON, AND REHEAT IS SUPPLIED BY BYPASSING 5% OF THE FLUE GAS. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE, AND THE SLUDGE IS DISPOSED IN A LINED POND. OPERATIONS COMMENCED IN APRIL 1980.
MINNKOTA POWER COOPERATIVE MILTON R. YOUNG 2 NEW 440 MW (GROSS) 185 MW (ESC) COAL .70 %S LIGNITE LIME/ALKALINE FLYASH COMBUSTION EQUIP ASSOCIATES ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 9/77	MINNKOTA POWER COOPERATIVE'S MILTON R. YOUNG 2 IS A CYCLONE FIRED LIGNITE (0.70%S, 6500 BTU/LB) BOILER LOCATED IN CENTER, NORTH DAKOTA. THE BOILER PRODUCES 2,021,400 ACFM OF FLUE GAS, HALF OF WHICH IS CLEANED BY TWO ESP'S AND TWO ADL/COMBUSTION EQUIPMENT ASSOCIATES LIME/ALKALINE FLYASH SPRAY TOWERS (75% DESIGN SO2 REMOVAL EFFICIENCY). THE CLEANED GAS PASSES THROUGH A CHEVRON MIST ELIMINATOR BEFORE IT JOINS A 15% BYPASS REHEAT, ALONG WITH THE UNSCRUBBED GAS, EXITS A 550 FOOT STACK. THE WATER LOOP IS OPEN, AND TH SLUDGE IS TRUCKED TO AN OFF-SITE MINEFILL. OPERATIONS BEGAN IN 1977.
MONONGAHELA POWER PLEASANTS 1 NEW 618 MW (GROSS) 618 MW (ESC) COAL 3.70 %S BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 3/79	MONONGAHELA POWER PLEASANTS 1 IS A BITUMINOUS COAL (3.70% S, 12,150 BTU/LB) FIRED BOILER IN BELMONT, WEST VIRGINIA. BABCOCK AND WILCOX SUPPLIED A LIME FGD SYSTEM DESIGNED TO REMOVE 90% OF THE FLUE GAS SO2 FROM THIS UNIT. THE EMISSION CONTROL SYSTEM INCLUDES AN ESP UPSTREAM OF FOUR SPRAY TOWER ABSORBERS. A FLUE GAS BYPASS SYSTEM PROVIDES REHEAT OF THE CLEANED GAS BEFORE IT IS DISCHARGED THROUGH A 1200 FOOT PLACITE LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP. THE FGD SYSTEM ON THIS UNIT HAS BEEN OPERATIONAL SINCE MARCH 1979.
MONONGAHELA POWER PLEASANTS 2 NEW 618 MW (GROSS) 618 MW (ESC) COAL 4.50 %S BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 10/80	MONONGAHELA POWER PLEASANTS 2 IS A BITUMINOUS COAL (4.5% S, 12,150 BTU/LB) FIRED BOILER LOCATED IN BELMONT, WEST VIRGINIA. BABCOCK AND WILCOX SUPPLIED A LIME FGD SYSTEM DESIGNED TO REMOVE 90% OF THE BOILER FLUE GAS SO2. THE EMISSION CONTROL SYSTEM ON THIS UNIT INCLUDES AN ESP UPSTREAM OF FOUR SPRAY TOWER ABSORBERS. A FLUE GAS BYPASS SYSTEM PROVIDES REHEAT OF THE CLEANED GAS BEFORE IT IS DISCHARGED THROUGH A 1200 FOOT PLACITE LINED STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP. THE FGD SYSTEM OPERATION COMMENCED IN OCTOBER 1980.
MONTANA POWER COLSTRIP 1 NEW 360 MW (GROSS) 360 MW (ESC) COAL .77 %S SUBBITUMINOUS LIME/ALKALINE FLYASH COMBUSTION EQUIP ASSOCIATES ENERGY CONSUMPTION: 3.3% STATUS 1 STARTUP 9/75	COLSTRIP 1 OF MONTANA POWER IS A SUBBITUMINOUS COAL (0.77% S, 8843 BTU/LB) FIRED UNIT LOCATED IN COLSTRIP, MONTANA. ADL/COMBUSTION EQUIPMENT ASSOCIATES SUPPLIED A LIME/ALKALINE FLYASH FGD SYSTEM CONSISTING OF THREE VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS. THE ABSORBERS ARE FOLLOWED BY HORIZONTAL CHEVRON MIST ELIMINATORS, A STEAM TUBE REHEATER, AND A 500 FOOT STACK. THE UNSTABILIZED SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THE WATER LOOP IS CLOSED. OPERATIONS INITIALLY BEGAN IN SEPTEMBER 1975.

UNIT IDENTIFICATION	ABSTRACT
MONTANA POWER COLSTRIP 2 NEW 360 MW (GROSS) 360 MW (ESC) COAL .77 %S SUBBITUMINOUS LIME/ALKALINE FLYASH COMBUSTION EQUIP ASSOCIATES ENERGY CONSUMPTION: 3.3% STATUS 1 STARTUP 5/76	COLSTRIP 2 OF MONTANA POWER IS A SUBBITUMINOUS COAL (0.77% S, 8843 BTU/LB) FIRED UNIT LOCATED IN COLSTRIP, MONTANA. ADL/COMBUSTION EQUIPMENT ASSOCIATES SUPPLIED A LIME/ALKALINE FLYASH FGD SYSTEM CONSISTING OF THREE VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS. THE ABSORBERS ARE FOLLOWED BY HORIZONTAL CHEVRON MIST ELIMINATORS, A STEAM TUBE REHEATER, AND A 500 FOOT STACK. THE UNSTABILIZED SLUDGE IS DISPOSED IN AN ON-SITE LINED POND. THE WATER LOOP IS CLOSED. OPERATIONS INITIALLY BEGAN IN MAY 1976.
MONTANA POWER COLSTRIP 3 NEW 700 MW (GROSS) 700 MW (ESC) COAL .70 %S LIME/ALKALINE FLYASH COMBUSTION EQUIP ASSOCIATES ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 0/83	MONTANA POWER'S COLSTRIP 3 IS A LOW SULFUR COAL (0.7% S, 8800 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN COLSTRIP, MONTANA. A CONTRACT HAS BEEN AWARDED TO ADL/COMBUSTION EQUIPMENT ASSOCIATES FOR A LIME/ALKALINE FLYASH FGD SYSTEM ON THIS UNIT. START UP IS SCHEDULED FOR 1983.
MONTANA POWER COLSTRIP 4 NEW 700 MW (GROSS) 700 MW (ESC) COAL .70 %S LIME/ALKALINE FLYASH COMBUSTION EQUIP ASSOCIATES ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 0/84	MONTANA POWER'S COLSTRIP 4 IS A LOW SULFUR COAL (0.7% S, 8800 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN COLSTRIP, MONTANA. A CONTRACT HAS BEEN AWARDED TO ADL/COMBUSTION EQUIPMENT ASSOCIATES FOR A LIME/ALKALINE FLYASH FGD SYSTEM ON THIS UNIT. START UP IS SCHEDULED FOR 1984.
MONTANA-DAKOTA UTILITIES COYOTE 1 NEW 440 MW (GROSS) 440 MW (ESC) COAL .87 %S LIGNITE SODIUM CARBONATE/SPRAY DRYING WHEELABRATOR-FRYE/R.I. ENERGY CONSUMPTION: 1.1% STATUS 2 STARTUP 3/81	COYOTE 1 IS A CYCLONE FIRED PULVERIZED LIGNITE (0.87% S, 7050 BTU/LB) BOILER UNDER CONSTRUCTION IN BEULAH, NORTH DAKOTA. THIS UNIT IS JOINTLY OWNED BY FIVE UTILITIES, WITH MONTANA-DAKOTA UTILITIES BEING THE MAJOR OWNER AND CONSTRUCTOR. AN AQUEOUS CARBONATE DRY FGD SYSTEM DESIGNED TO REMOVE 70% OF THE SO2 IS BEING SUPPLIED BY WHEELABRATOR-FRYE AND ROCKWELL INTERNATIONAL. THE SPRAY DRYER/BAGHOUSE SYSTEM IS SCHEDULED TO START UP IN 1981.
MUSCATINE POWER & WATER MUSCATINE 9 NEW 166 MW (GROSS) 166 MW (ESC) COAL 3.00 %S BITUMINOUS LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 4.8% STATUS 3 STARTUP 9/82	MUSCATINE 9 IS A PULVERIZED BITUMINOUS COAL (3% S, 11,200 BTU/LB) FIRED UNIT PLANNED BY MUSCATINE POWER AND WATER TO BE LOCATED IN MUSCATINE, IOWA. A CONTRACT WAS AWARDED TO RESEARCH COTTRELL FOR A LIMESTONE UNIT FOR EMISSION CONTROL. THE FGD SYSTEM WILL FEATURE AN ESP, TWO 100% CAPACITY TOWERS, STEAM COIL REHEAT, A CLOSED WATER LOOP, AND FORCED OXIDATION OF THE SLUDGE BEFORE LANDFILL. THE DESIGN SO2 REMOVAL WILL BE 94%. START UP WILL TAKE PLACE IN 1982.
NEBRASKA PUBLIC POWER DISTRICT FOSSIL III 1 NEW 650 MW (GROSS) 650 MW (ESC) COAL .36 %S SUBBITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 3/87	FOSSIL III 1 IS A PULVERIZED SUBBITUMINOUS COAL (0.36% S, 8000 BTU/LB) FIRED UNIT PLANNED BY THE NEBRASKA PUBLIC POWER DISTRICT TO BE LOCATED NEAR SARGENT, NEBRASKA. THE UTILITY IS CONSIDERING A DRY SCRUBBING FGD PROCESS TO CONTROL EMISSIONS FROM THE 650 MW BOILER. STARTUP FOR THE UNIT IS SCHEDULED FOR 1987.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
NEVADA POWER HARRY ALLEN 1 NEW 500 MW (GROSS) 500 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/86	NEVADA POWER'S HARRY ALLEN 1 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE 1986.
NEVADA POWER HARRY ALLEN 2 NEW 500 MW (GROSS) 500 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/87	NEVADA POWER'S HARRY ALLEN 2 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE 1987.
NEVADA POWER HARRY ALLEN 3 NEW 500 MW (GROSS) 500 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/88	NEVADA POWER'S HARRY ALLEN 3 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE 1988.
NEVADA POWER HARRY ALLEN 4 NEW 500 MW (GROSS) 500 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/89	NEVADA POWER'S HARRY ALLEN 4 IS A PLANNED COAL FIRED UNIT TO BE LOCATED IN LAS VEGAS, NEVADA. THE UTILITY IS CONSIDERING A HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED. START UP IS SCHEDULED FOR JUNE 1989.
NEVADA POWER REID GARDNER 1 RETROFIT 125 MW (GROSS) 125 MW (ESC) COAL .50 %S BITUMINOUS SODIUM CARBONATE COMBUSTION EQUIP ASSOCIATES ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 3/74	REID GARDNER 1 IS A WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. A SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM BY ADL/COMBUSTION EQUIPMENT ASSOCIATES CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PEFORATED PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM HOT AIR REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED SOLAR EVAPORATION POND. THE DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM HAS BEEN OPERATIONAL SINCE MARCH 1974.
NEVADA POWER REID GARDNER 2 RETROFIT 125 MW (GROSS) 125 MW (ESC) COAL .50 %S BITUMINOUS SODIUM CARBONATE COMBUSTION EQUIP ASSOCIATES ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/74	REID GARDNER 2 IS A WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. A SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM BY ADL/COMBUSTION EQUIPMENT ASSOCIATES CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PEFORATED PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM HOT AIR REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED SOLAR EVAPORATION POND. THE DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL 1974.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
NEVADA POWER REID GARDNER 3 NEW 125 MW (GROSS) 125 MW (ESC) COAL .50 %S BITUMINOUS SODIUM CARBONATE COMBUSTION EQUIP ASSOCIATES ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 7/76	REID GARDNER 3 IS A WET BOTTOM LOW SULFUR COAL (0.5% S, 12,450 BTU/LB) FIRED UNIT OWNED BY NEVADA POWER, LOCATED IN MOAPA, NEVADA. A SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM BY ADL/COMBUSTION EQUIPMENT ASSOCIATES CONSISTS OF ONE MODULE CONTAINING TWIN VARIABLE THROAT VENTURIS FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE STAGE PEFORATED PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MULTICLONES. A RADIAL VANE MIST ELIMINATOR PRECEDES AN INDIRECT STEAM HOT AIR REHEATER AND A 200 FOOT STACK. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE CLAY LINED SOLAR EVAPORATION POND. THE DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM HAS BEEN OPERATIONAL SINCE JUNE 1976.
NEVADA POWER REID GARDNER 4 NEW 250 MW (GROSS) 250 MW (ESC) COAL .75 %S SODIUM CARBONATE COMBUSTION EQUIP ASSOCIATES ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 4/83	REID GARDNER 4 OF NEVADA POWER IS A COAL (0.75% S, 12,450 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN MOAPA, NEVADA. A LETTER OF INTENT HAS BEEN SIGNED WITH COMBUSTION EQUIPMENT ASSOCIATES TO PROVIDE A SODIUM CARBONATE FGD SYSTEM. A BAGHOUSE WILL PRECEED THE FGD SYSTEM FOR PARTICLE CONTROL. CONSTRUCTION IS EXPECTED TO BEGIN IN 1980, AND START UP IS EXPECTED IN 1983.
NEVADA POWER WARNER VALLEY 1 NEW 295 MW (GROSS) 295 MW (ESC) COAL 1.15 %S SUBBITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 6/85	NEVADA POWER'S WARNER VALLEY 1 IS A PLANNED COAL (1.15% S) FIRED UNIT TO BE LOCATED IN ST. GEORGE, UTAH. THE UTILITY IS CURRENTLY EVALUATING BIDS FOR AN FGD SYSTEM. NO ANNOUNCEMENTS HAVE YET BEEN MADE CONCERNING THE EMISSION CONTROL STRATEGY FOR THIS UNIT. START UP IS EXPECTED IN JUNE 1985.
NEVADA POWER WARNER VALLEY 2 NEW 295 MW (GROSS) 295 MW (ESC) COAL 1.15 %S SUBBITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 6/86	NEVADA POWER'S WARNER VALLEY 2 IS A PLANNED COAL (1.15% S) FIRED UNIT TO BE LOCATED IN ST. GEORGE, UTAH. THE UTILITY IS CURRENTLY EVALUATING FOR AN FGD SYSTEM. NO ANNOUNCEMENTS HAVE YET BEEN MADE CONCERNING THE EMISSION CONTROL STRATEGY FOR THIS UNIT. START UP IS EXPECTED IN JUNE 1986.
NEW YORK STATE ELEC & GAS SOMERSET 1 NEW 625 MW (GROSS) 625 MW (ESC) COAL 2.20 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 6/84	THE NEW YORK STATE ELECTRIC & GAS CORP. HAS PLANS TO BUILD A PULVERIZED COAL FIRED BOILER IN SOMERSET, NEW YORK. THE BOILER IS TO GENERATE A FLUE GAS FLOW OF 2,227,000 ACFM AND BURN A BITUMINOUS COAL WITH AN AVERAGE SULFUR CONTENT OF 2.2% AND AN AVERAGE HEAT CONTENT OF 12,000 BTU/LB. A COLD SIDE ESP WITH A DESIGN EFFICIENCY OF 99.77% WILL PROVIDE THE PRIMARY PARTICULATE REMOVAL. A LIMESTONE ABSORBER WITH A DESIGN REMOVAL EFFICIENCY OF 90% WILL BE USED FOR SO2 REMOVAL. THE SYSTEM WILL OPERATE IN A CLOSED LOOP MODE. THE SLUDGE IS TO BE DEWATERED AND STABILIZED BEFORE BEING LANDFILLED. OPERATIONS ARE SCHEDULED FOR 1984.
NIAGARA MOHAWK POWER COOP CHARLES R. HUNTLEY 66 RETROFIT 100 MW (GROSS) 100 MW (ESC) COAL 1.80 %S AQUEOUS CARBONATE/SPRAY DRYING ROCKWELL INTERNATIONAL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 4/82	CHARLES R. HUNTLEY 66 OF NIAGARA POWER COOP IS A PULVERIZED COAL (1.8% S, 12,500 BTU/LB) FIRED UNIT LOCATED IN BUFFALO, NEW YORK. A CONTRACT WAS AWARDED TO ROCKWELL INTERNATIONAL FOR THE DESIGN AND INSTALLATION OF A 90% EFFICIENT RETROFIT AQUEOUS CARBONATE FGD SYSTEM WHICH WILL PRODUCE ELEMENTAL SULFUR AS AN END PRODUCT. FUNDS ARE BEING PROVIDED BY THE U.S.EPA AND THE EMPIRE STATE ELECTRIC ENERGY RESEARCH CORP. A SPRAY DRYER WILL BE FOLLOWED BY TWO BANKS OF EIGHT CYCLONES AN ESP, AND A 200 FOOT STEEL LINE STACK. THE WATER LOOP WILL BE OPEN. START UP OF THE FGD SYSTEM WILL BE IN 1982.

UNIT IDENTIFICATION	ABSTRACT
NORTHERN INDIANA PUB SERVICE DEAN H. MITCHELL 11 RETROFIT 116 MW (GROSS) 115 MW (ESC) COAL 3.50 %S WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: 12.1% STATUS 1 STARTUP 7/76	NORTHERN INDIANA PUBLIC SERVICE'S DEAN H. MITCHELL 11 IS A COAL (3.5% S, 11,000 BTU/LB) FIRED UNIT LOCATED IN GARY, INDIANA. A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY POWERGAS HAS BEEN OPERATING ON THIS UNIT SINCE JULY 1976. AN ESP IS FOLLOWED BY A VARIABLE THROAT VENTURI SCRUBBER AND A TRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL EFFICIENCY). A DIRECT COMBUSTION RAISES THE CLEANED GAS TEMPERATURE 50 DEG F BEFORE THE GAS IS DISCHARGED THROUGH A 168 FOOT STAINLESS STEEL AND FRP LINED STACK. ELEMENTAL SULFUR AND SULFATE IS PRODUCED BY THE PROCESS DEVELOPED BY ALLIED CHEMICAL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE.
NORTHERN INDIANA PUB SERVICE SCHAHFER 17 NEW 421 MW (GROSS) 421 MW (ESC) COAL 3.20 %S BITUMINOUS DUAL ALKALI FMC ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 6/83	SCHAHFER 17 OF NORTHERN INDIANA PUBLIC SERVICE IS A 3.2% SULFUR COAL FIRED UNIT PLANNED FOR CONSTRUCTION IN WHEATFIELD, INDIANA. THE UTILITY HAS AWARDED A CONTRACT TO FMC FOR THE INSTALLATION OF A DUAL ALKALI FGD SYSTEM AT THIS UNIT. PARTICULATE MATTER WILL BE COLLECTED BY AN ESP AND THE SYSTEM WILL INCLUDE A REHEATER. START UP OF THIS UNIT IS SCHEDULED FOR JUNE 1983.
NORTHERN INDIANA PUB SERVICE SCHAHFER 18 NEW 421 MW (GROSS) 421 MW (ESC) COAL 3.20 %S BITUMINOUS DUAL ALKALI FMC ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 6/85	SCHAHFER 18 OF NORTHERN INDIANA PUBLIC SERVICE IS A 3.2% SULFUR COAL FIRED UNIT PLANNED FOR CONSTRUCTION IN WHEATFIELD, INDIANA. THE UTILITY HAS AWARDED A CONTRACT TO FMC FOR THE INSTALLATION OF A DUAL ALKALI FGD SYSTEM AT THIS UNIT. PARTICULATE MATTER WILL BE COLLECTED BY AN ESP AND THE SYSTEM WILL INCLUDE A REHEATER. START UP OF THIS UNIT IS SCHEDULED FOR JUNE 1985.
NORTHERN STATES POWER METRO COAL 1 NEW 200 MW (GROSS) 200 MW (ESC) COAL 1.00 %S SUBBITUMINOUS LIME VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/90	NORTHERN STATES POWER HAS PLANS TO CONSTRUCT A 190 MW PULVERIZED COAL (1.0% S, 8700 BTU/LB) FIRED UNIT, METRO COAL 1. THE UNIT IS TO UTILIZE A LIME SPRAY DRYING SYSTEM ALONG WITH FABRIC FILTERS TO CONTROL EMISSIONS. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1990.
NORTHERN STATES POWER RIVERSIDE 6,7 RETROFIT 110 MW (GROSS) 110 MW (ESC) COAL 1.20 %S SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 11/80	RIVERSIDE 6 AND 7 ARE TWO COAL FIRED BOILERS OWNED BY NORTHERN STATES POWER AND LOCATED IN MINNEAPOLIS, MINNESOTA. EACH BOILER GENERATES A FLUE GAS FLOW OF 340,000 ACFM AT 350 F. CURRENTLY, A DEMONSTRATION LIME/SPRAY DRYING FGD SYSTEM THAT IS CAPABLE OF TREATING THE FLUE GAS FROM BOTH BOILERS IS BEING TESTED AT THIS UNIT. THE SYSTEM WAS SUPPLIED BY NIRO ATOMIZER/JOY MANUFACTURING AND CONSIST OF A SPRAY DRYER FOLLOWED BY A BAGHOUSE. THE CLEAN FLUE GAS IS VENTED TO TWO 275 FT CONCRETE STACKS WITH FIRE BRICK LINERS. SPENT ABSORBENT IS BEING DISPOSED OF IN ON AND OFF SITE LANDFILLS. OPERATIONS COMMENCED IN NOVEMBER 1980.
NORTHERN STATES POWER SHERBURNE 1 NEW 740 MW (GROSS) 740 MW (ESC) COAL .80 %S SUBBITUMINOUS LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 3/76	NORTHERN STATES POWER'S SHERBURNE 1 IS A BALANCED DRAFT PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8500 BTU/LB) FIRED BOILER IN BECKER, MINNESOTA. A 50% EFFICIENT (DESIGN) LIMESTONE/ALKALINE FLYASH FGD SYSTEM SUPPLIED BY COMBUSTION ENGINEERING HAS BEEN OPERATIONAL ON THIS UNIT SINCE MARCH 1976. TWELVE VARIABLE THROAT ROD DECK VENTURI/MARBLE BED ABSORBER TRAINS ARE FOLLOWED BY ONE CHEVRON MIST ELIMINATORS/TRAIN, AN IN-LINE HOT WATER REHEATER, AND A 650 FOOT CORTEN LINED STACK. THE SLUDGE IS FORCIBLY OXIDIZED AND DISPOSED IN A CLAY LINED SETTLING POND. THE WATER LOOP IS OPEN.

UNIT IDENTIFICATION	ABSTRACT
NORTHERN STATES POWER SHERBURNE 2 NEW 740 MW (GROSS) 740 MW (ESC) COAL .80 %S SUBBITUMINOUS LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 3/77	NORTHERN STATES POWER'S SHERBURNE 2 IS A BALANCED DRAFT PULVERIZED SUBBITUMINOUS COAL (0.80% S, 8500 BTU/LB) FIRED BOILER IN BECKER, MINNESOTA. A 50% EFFICIENT (DESIGN) LIMESTONE/ALKALINE FLYASH FGD SYSTEM SUPPLIED BY COMBUSTION ENGINEERING HAS BEEN OPERATIONAL ON THIS UNIT SINCE MARCH 1977. TWELVE VARIABLE THROAT ROD DECK VENTURI/MARBLE BED ABSORBER TRAINS ARE FOLLOWED BY ONE CHEVRON MIST ELIMINATORS/TRAIN, AN IN-LINE HOT WATER REHEATER, AND A 650 FOOT CORTEN LINED STACK. THE SLUDGE IS FORCIBLY OXIDIZED AND DISPOSED IN A CLAY LINED SETTLING POND. THE WATER LOOP IS OPEN.
NORTHERN STATES POWER SHERBURNE 3 NEW 850 MW (GROSS) 850 MW (ESC) COAL 1.00 %S SUBBITUMINOUS LIME VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/85	NORTHERN STATES POWER HAS PLANS TO CONSTRUCT A 800 MW PULVERIZED COAL (1.0%S, 8700 BTU/LB) FIRED BOILER, SHERBURNE 3, TO BE LOCATED NEXT TO THE SHERBURNE 1 AND 2 UNITS IN BECKER, MINNESOTA. THE UTILITY IS CONSIDERING THE USE OF A LIME SPRAY DRYING PROCESS ALONG WITH FABRIC FILTERS TO CONTROL EMISSIONS. THE SYSTEM IS SCHEDULED TO COMMENCE OPERATIONS IN 1985.
NORTHERN STATES POWER WISCONSIN COAL 1 NEW 670 MW (GROSS) 670 MW (ESC) COAL 1.00 %S SUBBITUMINOUS LIME VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/91	THE WISCONSIN COAL 1 UNIT OF NORTHERN STATES POWER IS A PLANNED 620 MW PULVERIZED COAL (1.0%S, 8700 BTU/LB) FIRED UNIT TO BE LOCATED IN DURAND, WISCONSIN. THE UTILITY IS CONSIDERING THE USE OF A LIME SPRAY DRYING SYSTEM ALONG WITH FABRIC FILTERS TO CONTROL EMISSIONS. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1991.
PACIFIC GAS & ELECTRIC MONTEZUMA 1 NEW 800 MW (GROSS) 800 MW (ESC) COAL .80 %S SUBBITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.5% STATUS 6 STARTUP 6/94	MONTEZUMA 1 OF PACIFIC GAS AND ELECTRIC IS A COAL (0.8% S, 12,000 BTU/LB) FIRED BOILER PLANNED FOR COLLINSVILLE, CALIFORNIA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A BAGHOUSE AND A LIMESTONE FGD SYSTEM. SLUDGE WILL BE DISPOSED OF IN A LANDFILL. START UP IS SCHEDULED FOR 1993.
PACIFIC GAS & ELECTRIC MONTEZUMA 2 NEW 800 MW (GROSS) 800 MW (ESC) COAL .80 %S SUBBITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.5% STATUS 6 STARTUP 6/90	MONTEZUMA 2 OF PACIFIC GAS AND ELECTRIC IS A COAL (0.8% S, 12,000 BTU/LB) FIRED BOILER PLANNED FOR COLLINSVILLE, CALIFORNIA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A BAGHOUSE AND A LIMESTONE FGD SYSTEM. SLUDGE WILL BE DISPOSED OF IN A LANDFILL. START UP IS SCHEDULED FOR 1994.
PACIFIC POWER & LIGHT JIM BRIDGER 1 RETROFIT 550 MW (GROSS) 550 MW (ESC) COAL .56 %S SUBBITUMIOUS SODIUM CARBONATE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/88	PACIFIC POWER AND LIGHT'S JIM BRIDGER 1 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (0.56%S, 9300 BTU/LB.) FIRED BOILER LOCATED IN ROCK SPRINGS, WYOMING. THE UTILITY IS EVALUATING BIDS FOR A RETROFIT FGD SYSTEM FOR SO2 CONTROL. A WET, SODIUM CARBONATE SYSTEM, WHICH TREATS 2,700,000 ACFM OF FLUE GAS, IS BEING PLANNED. A COLD-SIDE ESP IS CURRENTLY IN OPERATION FOR PRIMARY PARTICULATE CONTROL. STARTUP IS SCHEDULED FOR 1988.

UNIT IDENTIFICATION	ABSTRACT
PACIFIC POWER & LIGHT JIM BRIDGER 2 RETROFIT 550 MW (GROSS) 550 MW (ESC) COAL .56 %S SUBBITUMIOUS SODIUM CARBONATE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/84	PACIFIC POWER AND LIGHT'S JIM BRIDGER 2 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (0.56%S, 9300 BTU/LB.) FIRED BOILER LOCATED IN ROCK SPRINGS, WYOMING. THE UTILITY IS EVALUATING BIDS FOR A RETROFIT FGD SYSTEM FOR SO2 CONTROL. A WET, SODIUM CARBONATE SYSTEM, WHICH TREATS 2,700,000 ACFM OF FLUE GAS, IS BEING PLANNED. A COLD-SIDE ESP IS CURRENTLY IN OPERATION FOR PRIMARY PARTICULATE CONTROL. STARTUP IS SCHEDULED FOR 1984.
PACIFIC POWER & LIGHT JIM BRIDGER 3 RETROFIT 550 MW (GROSS) 550 MW (ESC) COAL .56 %S SUBBITUMIOUS SODIUM CARBONATE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/86	PACIFIC POWER AND LIGHT'S JIM BRIDGER 3 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (0.56%S, 9300 BTU/LB.) FIRED BOILER LOCATED IN ROCK SPRINGS, WYOMING. THE UTILITY IS EVALUATING BIDS FOR A RETROFIT FGD SYSTEM FOR SO2 CONTROL. A WET, SODIUM CARBONATE SYSTEM, WHICH TREATS 2,700,000 ACFM OF FLUE GAS, IS BEING PLANNED. A COLD-SIDE ESP IS CURRENTLY IN OPERATION FOR PRIMARY PARTICULATE CONTROL. STARTUP IS SCHEDULED FOR 1986.
PACIFIC POWER & LIGHT JIM BRIDGER 4 NEW 550 MW (GROSS) 550 MW (ESC) COAL .56 %S SUBBITUMINOUS SODIUM CARBONATE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: .2% STATUS 1 STARTUP 9/79	PACIFIC POWER AND LIGHT'S JIM BRIDGER 4 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (0.56% S, 9300 BTU/LB) FIRED BOILER LOCATED IN ROCK SPRINGS, WYOMING. A 91% EFFICIENT SODIUM CARBONATE FGD SYSTEM FOR THIS UNIT WAS SUPPLIED BY THE AIR CORRECTION DIVISION OF UOP. A COLD SIDE ESP TREATS 2,720,000 ACFM OF FLUE GAS, FOLLOWED BY THREE SIEVE TRAY ABSORBERS. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. A SYSTEM CHECK OUT WAS CONDUCTED IN JULY 1979, AND OPERATIONS BEGAN IN SEPTEMBER 1979.
PENNSYLVANIA POWER BRUCE MANSFIELD 1 NEW 917 MW (GROSS) 917 MW (ESC) COAL 3.00 %S BITUMINOUS LIME CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: 6.0% STATUS 1 STARTUP 12/75	BRUCE MANSFIELD 1 OF PENNSYLVANIA POWER IS A SUPERCRITICAL, BALANCED DRAFT BOILER FIRING PULVERIZED COAL (3.0% S, 11,500 BTU/LB) IN SHIPPINGPORT, PENNSYLVANIA. A CHEMICO THIOSORBIC LIME FGD SYSTEM WAS DESIGNED TO REMOVE FLYASH AND SO2 (92.1%) FROM 3,350,000 ACFM OF FLUE GAS. THE FGD SYSTEM CONSISTS OF SIX VARIABLE THROAT VENTURI SCRUBBERS FOLLOWED BY SIX FIXED THROAT VENTURI ABSORBERS, HORIZONTAL MIST ELIMINATORS, TWO DIRECT COMBUSTION REHEATERS (INCLUDED IN ORIGINAL DESIGN BUT LATER REMOVED FROM SERVICE AND A 950 FOOT FLAKEGLASS STACK SHARED BY UNITS 1 AND 2. THE WATER LOOP IS OPEN, AND THE CALCILOX STABILIZED SLUDGE IS DISPOSED IN AN OFF-SITE LANDFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE DECEMBER 1975.
PENNSYLVANIA POWER BRUCE MANSFIELD 2 NEW 917 MW (GROSS) 917 MW (ESC) COAL 3.00 %S BITUMINOUS LIME CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: 6.0% STATUS 1 STARTUP 7/77	BRUCE MANSFIELD 2 OF PENNSYLVANIA POWER IS A SUPERCRITICAL, BALANCED DRAFT BOILER FIRING PULVERIZED COAL (3.0% S, 11,500 BTU/LB) IN SHIPPINGPORT, PENNSYLVANIA. A CHEMICO THIOSORBIC LIME FGD SYSTEM WAS DESIGNED TO REMOVE FLYASH AND SO2 (92.1%) FROM 3,350,000 ACFM OF FLUE GAS. THE FGD SYSTEM CONSISTS OF SIX VARIABLE THROAT VENTURI SCRUBBERS FOLLOWED BY SIX FIXED THROAT VENTURI ABSORBERS, HORIZONTAL MIST ELIMINATORS, TWO DIRECT COMBUSTION REHEATERS (INCLUDED IN ORIGINAL DESIGN BUT LATER REMOVED FROM SERVICE AND A 950 FOOT FLAKEGLASS STACK SHARED BY UNITS 1 AND 2. THE WATER LOOP IS OPEN, AND THE CALCILOX STABILIZED SLUDGE IS DISPOSED IN AN OFF-SITE LANDFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE JULY 1977.
PENNSYLVANIA POWER BRUCE MANSFIELD 3 NEW 917 MW (GROSS) 917 MW (ESC) COAL 3.00 %S LIME PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 6/80	BRUCE MANSFIELD 3 OF PENNSYLVANIA POWER IS A SUPERCRITICAL PULVERIZED COAL (3.0% S, 11,500 BTU/LB) FIRED BOILER LOCATED IN SHIPPINGPORT, PENNSYLVANIA. FOUR ESP'S TREAT 3,308,000 ACFM OF FLUE GAS, FOLLOWED BY FIVE (ONE SPARE) PULLMAN KELLOGG THIOSORBIC LIME ABSORBERS WHICH REMOVE 92.2% OF THE SO2. THE CLEANED GAS PASSES THROUGH CHEVRON MIST ELIMINATORS AND DIRECT COMBUSTION REHEATERS BEFORE DISCHARGE THROUGH A 600 FOOT INCONEL 625 LINED STACK. THE FLYASH STABILIZED SLUDGE IS PIPED TO THE EXISTING OFF SITE LANDFILL PRESENTLY USED BY UNITS ONE AND TWO. OPERATIONS COMMENCED IN JUNE, 1980.

UNIT IDENTIFICATION	ABSTRACT
PHILADELPHIA ELECTRIC CROMBY 1 RETROFIT 150 MW (GROSS) 150 MW (ESC) COAL 3.00 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 5/83	PHILADELPHIA ELECTRIC HAS PLANS FOR THE RETROFIT OF AN FGD SYSTEM ON ONE OF THE TWO 3.0% SULFUR COAL FIRED BOILERS AT CROMBY STATION IN PHOENIXVILLE, PENNSYLVANIA. CONSTRUCTION OF THE MAGNESIUM OXIDE SYSTEM SUPPLIED BY UNITED ENGINEERS HAS COMMENCED. THE START UP DATE IS SET FOR 1983.
PHILADELPHIA ELECTRIC EDDYSTONE 1 RETROFIT 240 MW (GROSS) 240 MW (ESC) COAL 2.60 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 12/82	UNIT 1 OF PHILADELPHIA ELECTRIC'S EDDYSTONE, PENNSYLVANIA STATION IS A BITUMINOUS COAL (2.6% S, 13,600 BTU/LB) FIRED UNIT WHICH USES ESP'S, MECHANICAL COLLECTORS, AND THREE PARTICLE SCRUBBERS (TWO ROD DECK SPRAY TOWERS AND ONE VENTURI) FOR PRIMARY PARTICLE CONTROL. THE UNIT 1 FGD SYSTEM WILL FOLLOW THE TWO ROD DECK SPRAY TOWERS. UNITED ENGINEERS IS SUPPLYING A MAGNESIUM OXIDE FGD SYSTEM FOR SO2 EMISSION CONTROL SIMILAR TO THE MAGNESIUM OXIDE PROTOTYPE SYSTEM THAT WAS PREVIOUSLY OPERATED AT THIS UNIT. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1982.
PHILADELPHIA ELECTRIC EDDYSTONE 2 RETROFIT 334 MW (GROSS) 334 MW (ESC) COAL 2.50 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 12/82	EDDYSTONE 2 OF PHILADELPHIA ELECTRIC IS A 2.5% SULFUR COAL FIRED BOILER LOCATED IN EDDYSTONE, PENNSYLVANIA. THE PLANT'S GENERATING CAPACITY IS 334 MW. UNITED ENGINEERS WILL SUPPLY A MAGNESIUM OXIDE FGD SYSTEM FOR EMISSION CONTROL. START UP IS SET FOR DECEMBER 1982.
PLAINS ELECTRIC G & T COOP PLAINS ESCALANTE 1 NEW 233 MW (GROSS) 233 MW (ESC) COAL .80 %S SUBBITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 12/83	PLAINS ESCALANTE 1 IS A PULVERIZED SUBBITUMINOUS COAL FIRED UNIT PLANNED BY PLAINS ELECTRIC G & T COOPERATIVE TO BE LOCATED IN PREWITT, NEW MEXICO. THE 233 MW UNIT WILL UTILIZE A WET LIMESTONE SCRUBBING PROCESS FOR SO2 REMOVAL AND A FABRIC FILTER FOR PRIMARY PARTICLE CONTROL. A CONTRACT HAS BEEN AWARDED TO COMBUSTION ENGINEERING FOR THE WET LIMESTONE SYSTEM. THE UNIT INITIAL STARTUP IS PROJECTED FOR DECEMBER 1983.
PLATTE RIVER POWER AUTHORITY RAWHIDE 1 NEW 279 MW (GROSS) 279 MW (ESC) COAL .25 %S BITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: .0% STATUS 3 STARTUP 12/83	THE PLATTE RIVER POWER AUTHORITY HAS PLANS TO CONSTRUCT RAWHIDE 1, IN FT. COLLINS, COLORADO. THE 279 MW PULVERIZED COAL (0.25% S, 8702 BTU/LB) FIRED BOILER WILL BE SUPPLIED BY COMBUSTION ENGINEERING. A CONTRACT HAS BEEN AWARDED TO JOY MANUFACTURING/NIRO ATOMIZER FOR A DRY LIME SCRUBBING SYSTEM FOR EMISSION CONTROL. SLUDGE WILL BE DISPOSED OF IN A LANDFILL. THE UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN DECEMBER 1983.
PUBLIC SERVICE INDIANA GIBSON 5 NEW 650 MW (GROSS) 650 MW (ESC) COAL 3.30 %S LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 0/82	GIBSON 5 OF PUBLIC SERVICE OF INDIANA IS A 3.3% SULFUR COAL FIRED UNIT UNDER CONSTRUCTION IN PRINCETON, INDIANA. A CONTRACT WAS AWARDED TO PULLMAN KELLOGG FOR A LIMESTONE FGD SYSTEM CONSISTING OF FOUR KELLOGG-WEIR ABSORBER-REACTOR MODULES. SYSTEM START UP IS EXPECTED IN 1982. THE SYSTEM WILL USE KELLOGG'S PROPRIETARY MAGNESIUM-PROMOTED LIMESTONE.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 1 RETROFIT 361 MW (GROSS) 361 MW (ESC) COAL .80 %S SUBBITUMINOUS WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: 4.4% STATUS 1 STARTUP 4/78	SAN JUAN 1 OF PUBLIC SERVICE OF NEW MEXICO IN WATERFLOW, NEW MEXICO IS A COAL (0.8% S, 8100 BTU/LB) FIRED BOILER WHICH SUPPLIES 1,319,000 ACFM OF FLUE GAS TO A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY POWERGAS. THE EMISSION CONTROL SYSTEM, OPERATIONAL SINCE APRIL 1978, CONSISTS OF A HOT SIDE ESP FOLLOWED BY FOUR (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS WHICH WERE DESIGNED TO REMOVE 85% OF THE FLUE GAS SO2. AN INDIRECT HOT AIR REHEATER PRECEDES A BRICK LINED STACK. END PRODUCT ELEMENTAL SULFUR IS PRODUCED BY THE ALLIED CHEMICAL PROCESS. THE WATER LOOP IS CLOSED.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 2 RETROFIT 350 MW (GROSS) 350 MW (ESC) COAL .80 %S SUBBITUMINOUS WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: 4.6% STATUS 1 STARTUP 8/78	SAN JUAN 2 OF PUBLIC SERVICE OF NEW MEXICO IN WATERFLOW, NEW MEXICO IS A COAL (0.8% S, 8100 BTU/LB) FIRED BOILER WHICH SUPPLIES 1,319,000 ACFM OF FLUE GAS TO A RETROFIT WELLMAN LORD FGD SYSTEM BY DAVY POWERGAS. THE EMISSION CONTROL SYSTEM, OPERATIONAL SINCE AUGUST 1978, CONSISTS OF A HOT SIDE ESP FOLLOWED BY FOUR (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER TRAINS WHICH WERE DESIGNED TO REMOVE 85% OF THE FLUE GAS SO2. AN INDIRECT HOT AIR REHEATER PRECEDES A BRICK LINED STACK. END PRODUCT ELEMENTAL SULFUR IS PRODUCED BY THE ALLIED CHEMICAL PROCESS. THE WATER LOOP IS CLOSED.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 3 NEW 534 MW (GROSS) 534 MW (ESC) COAL .80 %S SUBBITUMINOUS WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: 3.6% STATUS 1 STARTUP 12/79	SAN JUAN 3 IS A COAL (0.8% S, 8100 BTU/LB) FIRED UNIT OF THE PUBLIC SERVICE OF NEW MEXICO AND IS LOCATED IN WATERFLOW, NEW MEXICO. THE FGD SYSTEM, SUPPLIED BY DAVY POWERGAS IS AN INTEGRATION OF THE WELLMAN LORD SO2 RECOVERY PROCESS AND ALLIED CHEMICAL'S SO2 REDUCTION TO SULFUR PROCESS. FIVE (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL) TRAINS FOLLOW A HOT SIDE ESP. AN INDIRECT HOT AIR REHEATER BOOSTS THE GAS TEMPERATURE 50 DEG F. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. OPERATIONS COMMENCED IN DECEMBER 1979.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 4 NEW 534 MW (GROSS) 534 MW (ESC) COAL .80 %S SUBBITUMINOUS WELLMAN LORD DAVY MCKEE ENERGY CONSUMPTION: 3.6% STATUS 2 STARTUP 6/82	SAN JUAN 4 IS A COAL (0.8% S, 8100 BTU/LB) FIRED UNIT OF THE PUBLIC SERVICE OF NEW MEXICO UNDER CONSTRUCTION IN WATERFLOW, NEW MEXICO. THE FGD SYSTEM BEING SUPPLIED BY DAVY POWERGAS IS AN INTEGRATION OF THE WELLMAN LORD SO2 RECOVERY PROCESS AND ALLIED CHEMICAL'S SO2 REDUCTION TO SULFUR PROCESS. FIVE (ONE SPARE) VENTURI SCRUBBER/SPRAY TOWER ABSORBER (90% DESIGN SO2 REMOVAL) TRAINS WILL FOLLOW A HOT SIDE ESP. AN INDIRECT HOT AIR REHEATER WILL BOOST THE GAS TEMPERATURE 50 DEG F. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP IS EXPECTED IN JUNE 1982.
PWR AUTHORITY OF STATE OF NY FOSSIL NEW 700 MW (GROSS) 700 MW (ESC) COAL 3.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 4/87	THE POWER AUTHORITY OF NEW YORK PLANS A NEW 3.0% SULFUR COAL FIRED UNIT WHICH WILL BE LOCATED AT THE ARTHUR KILL FACILITY ON STATEN ISLAND. THE UTILITY IS PRESENTLY CONSIDERING FGD SYSTEMS FOR THIS UNIT. PUBLIC SERVICE COMMISSION HEARINGS ARE CURRENTLY IN PROGRESS. START UP IS EXPECTED IN APRIL 1987.
SALT RIVER PROJECT CORONADO 1 NEW 350 MW (GROSS) 280 MW (ESC) COAL 1.00 %S SUBBITUMINOUS LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: 4.3% STATUS 1 STARTUP 11/79	SALT RIVER PROJECT'S CORONADO 1 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (1.0% S, 8300 BTU/LB) FIRED BOILER LOCATED IN ST. JOHNS, ARIZONA. PULLMAN KELLOGG SUPPLIED THE TWO LIMESTONE HORIZONTAL WEIR SPRAY TOWERS WHICH REMOVES 82.5% OF THE SO2 FROM THE FLUE GAS PASSED THROUGH THEM. VERTICAL HEIL MIST ELIMINATORS PRECEDE A 500 FOOT STACK. A MINIMUM OF 20% BYPASS PROVIDES REHEAT. THE WATER LOOP IS AN OPEN MODE, AND THE UNSTABILIZED SLUDGE IS DISPOSED IN AN UNLINED POND. START UP WAS IN NOVEMBER 1979.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
SALT RIVER PROJECT CORONADO 2 NEW 350 MW (GROSS) 280 MW (ESC) COAL 1.00 %S SUBBITUMINOUS LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: 4.3% STATUS 1 STARTUP 7/80	SALT RIVER PROJECT'S CORONADO 2 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (1.0% S, 8300 BTU/LB) FIRED BOILER LOCATED IN ST. JOHNS, ARIZONA. PULLMAN KELLOGG SUPPLIED TWO LIMESTONE HORIZONTAL WEIR SPRAY TOWERS WHICH REMOVES 82.5% OF THE SO2 FROM THE FLUE GAS PASSED THROUGH THEM. VERTICAL HEIL MIST ELIMINATORS PRECEDE A 500 FOOT STACK. A MINIMUM OF 20% BYPASS PROVIDES REHEAT. THE WATER LOOP IS AN OPEN MODE, AND THE UNSTABILIZED SLUDGE IS DISPOSED IN AN UNLINED POND. START UP WAS IN JULY 1980.
SALT RIVER PROJECT CORONADO 3 NEW 400 MW (GROSS) 280 MW (ESC) COAL .60 %S SUBBITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 3.8% STATUS 6 STARTUP 0/89	CORONADO 3 IS A DRY BOTTOM PULVERIZED SUBBITUMINOUS COAL (.60% S, 8300 BTU/LB) FIRED UNIT PLANNED BY SALT RIVER PROJECT TO BE LOCATED IN ST. JOHN'S, ARIZONA. THE UTILITY IS PRESENTLY CONSIDERING THE INSTALLATION OF TWO HORIZONTAL SPRAY TOWERS UTILIZING LIMESTONE AS THE ABSORBENT. PLANS FOR AN EMISSION CONTROL SYSTEM HAVE NOT BEEN FINALIZED. THE SYSTEM WILL HAVE A 20% BYPASS REHEAT, AND THE SLUDGE WILL PROBABLY BE PONDED. SCHEDULED OPERATION DATE IS 1989.
SAN MIGUEL ELECTRIC COOP SAN MIGUEL 1 NEW 400 MW (GROSS) 400 MW (ESC) COAL 1.70 %S LIGNITE LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 5.0% STATUS 2 STARTUP 8/81	SAN MIGUEL 1 OF THE SAN MIGUEL ELECTRIC COOP IS A LIGNITE (1.7% S, 5000 BTU/LB) FIRED RADIANT BOILER UNDER CONSTRUCTION IN SAN MIGUEL, TEXAS. THE EMISSION CONTROL SYSTEM ON THIS UNIT WILL CONSIST OF A COLD SIDE ESP FOLLOWED BY FOUR BABCOCK AND WILCOX 86% EFFICIENT LIMESTONE TCA MODULES. CHEVRON MIST ELIMINATORS WILL PRECEDE AN IN-LINE REHEATER AND AN ACID BRICK LINED STACK. THE WATER LOOP WILL BE CLOSED, AND THE DEWATERED SLURRY WILL BE MIXED WITH FLYASH BY RESEARCH COTTRELL AND DISPOSED IN AN OFF SITE LANDFILL. OPERATIONS ARE SCHEDULED TO COMMENCE IN AUGUST 1981.
SEMINOLE ELECTRIC SEMINOLE 1 NEW 620 MW (GROSS) 620 MW (ESC) COAL 2.75 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 3/83	SEMINOLE 1 OF SEMINOLE ELECTRIC IS A COAL (2.75% S, 11,700 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN PALATKA, FLORIDA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF ESP'S AND A LIMESTONE FGD SYSTEM. THE FGD SYSTEM WILL BE SUPPLIED BY PEABODY PROCESS SYSTEMS. START UP IS EXPECTED IN MARCH 1983.
SEMINOLE ELECTRIC SEMINOLE 2 NEW 620 MW (GROSS) 620 MW (ESC) COAL 2.75 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 3/85	SEMINOLE 2 OF SEMINOLE ELECTRIC IS A COAL (2.75% S, 11,700 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN PALATKA, FLORIDA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF ESP'S AND A LIMESTONE FGD SYSTEM. THE FGD SYSTEM WILL BE SUPPLIED BY PEABODY SYSTEMS. START UP IS EXPECTED IN MARCH 1985.
SIERRA PACIFIC POWER VALMY 2 NEW 276 MW (GROSS) 276 MW (ESC) COAL ***** %S LIME/SPRAY DRYING VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 7 STARTUP 8/84	SIERRA PACIFIC POWER HAS PLANS TO CONSTRUCT A 276 MW UNIT TO BE LOCATED IN VALMY, NEVADA. THE FOSTER WHEELER PULVERIZED COAL FIRED BOILER AT THE VALMY 2 STATION WILL UTILIZE AN FGD SYSTEM OR FIRE LOW SULFUR COAL TO CONTROL SO2 EMISSIONS. IF FGD IS SELECTED, A DRY LIME SYSTEM WILL BE UTILIZED. THE UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN AUGUST 1984.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
SIKESTON BRD OF MUNICIPAL UTIL SIKESTON 1 NEW 235 MW (GROSS) 235 MW (ESC) COAL 2.80 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 1.7% STATUS 2 STARTUP 6/81	THE SIKESTON BOARD OF MUNICIPAL UTILITIES' SIKESTON 1 IS A PULVERIZED COAL (2.8% S, 11,340 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN SIKESTON, MISSOURI. BABCOCK AND WILCOX IS SUPPLYING AN EMISSION CONTROL SYSTEM CONSISTING OF TWO ESP'S AND THREE 50% CAPACITY LIMESTONE VENTURI FGD MODULES. THE CLEANED GAS WILL PASS THROUGH CHEVRON MIST ELIMINATORS BEFORE EXITING A 450 FOOT FRP LINED FLUE (A SECOND CARBON STEEL LINED FLUE, USED FOR EMERGENCY BYPASS, IS ALSO IN THE STACK). THE WATER LOOP WILL BE OPEN, AND THE SLUDGE WILL BE PONDED. START UP IS SLATED FOR JUNE 1981.
SOUTH CAROLINA PUBLIC SERVICE CROSS 1 NEW 500 MW (GROSS) 500 MW (ESC) COAL 1.80 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 3/85	SOUTH CAROLINA PUBLIC SERVICE HAS PLANS TO CONSTRUCT TWO NEW UNITS, CROSS 1 AND 2, TO BE LOCATED IN CROSS, SOUTH CAROLINA. EACH 500 MW BOILER WILL FIRE COAL WITH A SULFUR CONTENT RANGING BETWEEN 1.0 AND 2.3%. THE UTILITY HAS SIGNED A CONTRACT WITH PEABODY PROCESS SYSTEMS FOR THE INSTALLATION OF A WET LIMESTONE SCRUBBING SYSTEM TO CONTROL SO2 EMISSIONS. UNIT 1 IS SCHEDULED TO COMMENCE OPERATIONS IN MARCH 1985.
SOUTH CAROLINA PUBLIC SERVICE CROSS 2 NEW 500 MW (GROSS) 500 MW (ESC) COAL 1.80 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 1/84	SOUTH CAROLINA PUBLIC SERVICE HAS PLANS TO CONSTRUCT TWO NEW UNITS, CROSS 1 AND 2, TO BE LOCATED IN CROSS, SOUTH CAROLINA. EACH 500 MW BOILER WILL FIRE COAL WITH A SULFUR CONTENT RANGING BETWEEN 1.0 AND 2.3%. THE UTILITY HAS SIGNED A CONTRACT WITH PEABODY PROCESS SYSTEMS FOR THE INSTALLATION OF A WET LIMESTONE SCRUBBING SYSTEM TO CONTROL SO2 EMISSIONS. UNIT 2 IS SCHEDULED TO COMMENCE OPERATIONS IN JANUARY 1984.
SOUTH CAROLINA PUBLIC SERVICE WINYAH 2 NEW 280 MW (GROSS) 140 MW (ESC) COAL 1.70 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 1.1% STATUS 1 STARTUP 7/77	WINYAH 2 OF SOUTH CAROLINA PUBLIC SERVICE IS A PULVERIZED BITUMINOUS COAL (1.70% S, 11,500 BTU/LB) FIRED UNIT LOCATED IN GEORGETOWN, SOUTH CAROLINA. A COLD SIDE ESP AND A BABCOCK AND WILCOX VENTURI SCRUBBER/LIMESTONE TRAY TOWER ABSORBER TRAIN DESIGNED TO REMOVE 45% OF THE SO2 FROM THE BOILER FLUE GAS MAKE UP THE EMISSION CONTROL SYSTEM ON THIS UNIT. THE SYSTEM OPERATES IN AN OPEN WATER LOOP, AND THE SLUDGE IS DISPOSED IN AN ON-SITE UNLINED POND. THIS SYSTEM HAS BEEN OPERATIONAL SINCE JULY 1977.
SOUTH CAROLINA PUBLIC SERVICE WINYAH 3 NEW 280 MW (GROSS) 280 MW (ESC) COAL 1.70 %S LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 2.1% STATUS 1 STARTUP 5/80	WINYAH 3 OF SOUTH CAROLINA PUBLIC SERVICE IS A DRY BOTTOM BOILER WHICH FIRES 1.7% SULFUR COAL (11,500 BTU/LB) AND IS LOCATED IN GEORGETOWN, SOUTH CAROLINA. AN ESP PRECEDES A BABCOCK AND WILCOX LIMESTONE FGD SYSTEM AND AN INDIRECT STEAM REHEATER. THE SYSTEM OPERATES IN A CLOSED WATER LOOP MODE. OPERATIONS COMMENCED IN MAY 1980.
SOUTH CAROLINA PUBLIC SERVICE WINYAH 4 NEW 280 MW (GROSS) 280 MW (ESC) COAL 1.70 %S BITUMINOUS LIMESTONE AMERICAN AIR FILTER ENERGY CONSUMPTION: 2.1% STATUS 2 STARTUP 7/81	SOUTH CAROLINA PUBLIC SERVICE'S WINYAH 4 IS A BITUMINOUS COAL (1.70% S, 11,500 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN GEORGETOWN, SOUTH CAROLINA. TWO AMERICAN AIR FILTER LIMESTONE SLURRY SPRAY TOWERS WILL FOLLOW AN ESP. THE TEMPERATURE OF THE CLEANED GAS WILL BE RAISED BY AN INDIRECT STEAM REHEATER. THE SYSTEM WILL OPERATE IN A CLOSED WATER LOOP MODE. START UP IS EXPECTED IN JULY 1981.

UNIT IDENTIFICATION	ABSTRACT
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW, SR. 1 NEW 200 MW (GROSS) 124 MW (ESC) COAL 1.30 %S BITUMINOUS LIMESTONE ENVIRONEERING, RILEY STOKER ENERGY CONSUMPTION: 5.5% STATUS 1 STARTUP 8/78	R.D. MORROW 1 OF SOUTHERN MISSISSIPPI ELECTRIC IS A PULVERIZED COAL (1.3% S, 12,000 BTU/LB) FIRED UNIT IN HATTISBURG, MISSISSIPPI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP FOLLOWED BY A LIMESTONE VENTRI-ROD ABSORBER SUPPLIED BY RILEY STOKER/ENVIRONEERING. AFTER THE CLEANED GAS PASSES THROUGH A VERTICAL CHEVRON MIST ELIMINATOR, IT IS JOINED BY A 38% BYPASS REHEAT BEFORE IT IS DISCHARGED THROUGH A 408 FOOT STACK SHARED BY UNITS 1 AND 2 (EACH UNIT HAS ITS OWN ACID BRICK LINED FLUE). THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS HAULED BY TRUCK TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE AUGUST 1978.
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW, SR. 2 NEW 200 MW (GROSS) 124 MW (ESC) COAL 1.30 %S BITUMINOUS LIMESTONE ENVIRONEERING, RILEY STOKER ENERGY CONSUMPTION: 5.5% STATUS 1 STARTUP 6/79	R.D. MORROW 2 OF SOUTHERN MISSISSIPPI ELECTRIC IS A PULVERIZED COAL (1.3% S, 12,000 BTU/LB) FIRED UNIT IN HATTISBURG, MISSISSIPPI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HOT SIDE ESP FOLLOWED BY A LIMESTONE VENTRI-ROD ABSORBER SUPPLIED BY RILEY STOKER/ENVIRONEERING. AFTER THE CLEANED GAS PASSES THROUGH A VERTICAL CHEVRON MIST ELIMINATOR, IT IS JOINED BY A 38% BYPASS REHEAT BEFORE IT IS DISCHARGED THROUGH A 408 FOOT STACK SHARED BY UNITS 1 AND 2 (EACH UNIT HAS ITS OWN ACID BRICK LINED FLUE). THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS HAULED BY TRUCK TO AN OFF SITE LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE JUNE 1979.
SOUTHERN ILLINOIS POWER COOP MARION 4 NEW 173 MW (GROSS) 173 MW (ESC) COAL/REFUS 3.75 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 2.3% STATUS 1 STARTUP 5/79	UNIT 4 AT SOUTHERN ILLINOIS POWER COOP'S MARION STATION IN MARION, ILLINOIS IS A CYCLONE FIRED COAL (3.5% S, 9000 BTU/LB) BOILER WHICH IS SERVED BY A 89.4% EFFICIENT (DESIGN) LIMESTONE FGD SYSTEM SUPPLIED BY BABCOCK AND WILCOX. TWO SPRAY TOWERS AND A BRICK LINED STACK ARE DOWNSTREAM OF AN ESP IN THIS SYSTEM. THE WATER LOOP IS OPEN, AND THE FLYASH STABILIZED SLUDGE IS DEWATERED AND LANDFILLED. THE SYSTEM BECAME OPERATIONAL DURING MAY 1979.
SOUTHERN ILLINOIS POWER COOP MARION 5 NEW 300 MW (GROSS) 300 MW (ESC) COAL 3.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/88	MARION 5 IS A COAL (3.0% S, 9000 BTU/LB) FIRED UNIT PLANNED BY SOUTHERN ILLNOIS POWER COOP FOR LOCATION IN MARION, ILLINOIS. THE UTILITY HAS NOT YET DECIDED ON AN FGD PROCESS AS IT IS WAITING FOR THE FINALIZATION OF THE SO2 REGULATIONS THE UNIT WILL HAVE TO MEET. START UP IS EXPECTED IN 1988.
SOUTHERN INDIANA GAS & ELEC A.B. BROWN 1 NEW 265 MW (GROSS) 265 MW (ESC) COAL 3.35 %S BITUMINOUS DUAL ALKALI FMC ENERGY CONSUMPTION: .8% STATUS 1 STARTUP 3/79	SOUTHERN INDIANA GAS AND ELECTRIC'S A.B.BROWN 1 IS A DRY BOTTOM PULVERIZED COAL (3.35% S, 13,010 BTU/LB) FIRED UNIT IN WEST FRANKLIN, INDIANA. FMC SUPPLIED A DUAL ALKALI FGD SYSTEM DESIGNED TO REMOVE 85% OF THE FLUE GAS SO2. THE UNIT CONSISTS OF TWO THREE STAGE DISC CONTACTORS. A COLD SIDE ESP PROVIDES PRIMARY PARTICULATE CONTROL, AND ONE CHEVRON MIST ELIMINATOR/MODULE PRECEDES A 498 FOOT ACID BRICK LINED STACK. THE SYSTEM PRODUCES A FILTER CAKE WASTE PRODUCT WHICH IS DISPOSED IN AN ON SITE LANDFILL. THE WATER LOOP CAN BE EITHER OPEN OR CLOSED. THE SYSTEM HAS BEEN OPERATIONAL SINCE MARCH 1979.
SOUTHWESTERN ELECTRIC POWER DOLET HILLS 1 NEW 720 MW (GROSS) 720 MW (ESC) COAL .70 %S LIGNITE LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 3/86	DOLET HILLS 1 OF SOUTHWESTERN ELECTRIC POWER IS A PLANNED 720 MW LIGNITE (0.7%S, 7100BTU/LB) FIRED BOILER TO BE LOCATED IN MANSFIELD, LOUISIANA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF AN ESP FOR PARTICULATE CONTROL AND A WET LIMESTONE FGD SYSTEM FOR SO2 CONTROL. THE FLUE GAS WILL EXIT THROUGH A 525 FOOT STACK. A CONTRACT HAS BEEN AWARDED TO UOP FOR THE FGD SYSTEM. THE UNIT IS SCHEDULED TO STARTUP IN 1986.

UNIT IDENTIFICATION	ABSTRACT
SOUTHWESTERN ELECTRIC POWER DOLET HILLS 2 NEW 720 MW (GROSS) 720 MW (ESC) COAL .70 %S LIGNITE LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 3/88	DOLET HILLS 2 OF SOUTHWESTERN ELECTRIC POWER IS A PLANNED 720 MW LIGNITE (0.7%S, 7100BTU/LB) FIRED BOILER TO BE LOCATED IN MANSFIELD, LOUISIANA. THE EMISSION CONTROL SYSTEM WILL CONSIST OF AN ESP FOR PARTICULATE CONTROL AND A WET LIMESTONE FGD SYSTEM FOR SO2 CONTROL. THE FLUE GAS WILL EXIT THROUGH A 525 FOOT STACK. THE UNIT IS SCHEDULED TO BEGIN OPERATIONS IN 1988.
SOUTHWESTERN ELECTRIC POWER HENRY W. PIRKEY 1 NEW 720 MW (GROSS) 720 MW (ESC) COAL .80 %S LIGNITE LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 12/84	HENRY W. PIRKEY 1 IS A WET BOTTOM LIGNITE (0.8% S, 6300 BTU/LB) FIRED UNIT PLANNED BY SOUTHWESTERN ELECTRIC POWER FOR LOCATION IN HALLSVILLE, TEXAS. A CONTRACT HAS BEEN AWARDED TO THE AIR CORRECTION DIVISION OF UOP FOR FOUR LIMESTONE SPRAY TOWERS (99+% EFFICIENCY). MIST ELIMINATION WILL BE PROVIDED BY TWO STAGE CHEVRONS, AND THE STACK WILL BE ACID BRICK LINED. NO REHEAT IS PLANNED. THE WATER LOOP WILL BE CLOSED, AND THE SLUDGE WILL BE POZ-O-TEC STABILIZED. START UP IS EXPECTED BY DECEMBER 1984.
SOYLAND POWER COOP SOYLAND 1 NEW 500 MW (GROSS) 500 MW (ESC) COAL 3.00 %S UNDECIDED PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/87	SOYLAND POWER COOP HAS PLANS FOR A NEW UNIT, SOYLAND 1, TO BE LOCATED IN ILLINOIS. THE COAL FIRED BOILER IS TO BE RATED AT 500 MW (GROSS) AND UTILIZE A FGD SYSTEM TO CONTROL EMISSIONS. OPERATIONS ARE SCHEDULED TO COMMENCE IN 1987.
SPRINGFIELD CITY UTILITIES SOUTHWEST 1 NEW 194 MW (GROSS) 194 MW (ESC) COAL 3.50 %S BITUMINOUS LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 4.6% STATUS 1 STARTUP 4/77	SPRINGFIELD CITY UTILITIES' SOUTHWEST 1 IS A PULVERIZED BITUMINOUS COAL (3.5% S, 12,500 BTU/LB) FIRED BOILER LOCATED IN SPRINGFIELD, MISSOURI. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A COLD SIDE ESP FOLLOWED BY TWO UOP LIMESTONE TCA MODULES WHICH WERE DESIGNED TO REMOVE 80% OF THE FLUE GAS SO2. ONE CHEVRON/MODULE LEADS TO A 384 FOOT CEILCOTE LINED STACK. THE DRY FLYASH STABILIZED SLUDGE IS DEWATERED BY A ROTARY DRUM VACUUM AND TRUCKED TO A LANDFILL. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL 1977.
SPRINGFIELD WATER, LIGHT & PWR DALLMAN 3 NEW 205 MW (GROSS) 205 MW (ESC) COAL 3.30 %S LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 5.9% STATUS 1 STARTUP 10/80	DALLMAN 3 OF SPRINGFIELD WATER, LIGHT, AND POWER IS A PULVERIZED COAL (3.3% S, 10,500 BTU/LB) FIRED BOILER LOCATED IN SPRINGFIELD, ILLINOIS. RESEARCH COTTRELL SUPPLIED A LIMESTONE FGD SYSTEM DESIGNED TO REMOVE 95% OF THE SO2 FROM 850,000 ACFM OF BOILER FLUE GAS. A HOT SIDE ESP PRECEDES TWO PACKED TOWER ABSORBERS, ONE HORIZONTAL CHEVRON PER MODULE, AND A 500 FOOT ACID BRICK LINED STACK. NO REHEAT IS PROVIDED. SLUDGE IS DISPOSED OF IN A LANDFILL. FGD OPERATIONS COMMENCED IN OCTOBER 1980.
ST. JOE ZINC G.F. WEATON 1 RETROFIT 60 MW (GROSS) 60 MW (ESC) COAL 2.00 %S BITUMINOUS CITRATE MORRISON & KNUDSEN/U.S.B.M. ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 11/79	G.F. WEATON 1, OWNED BY ST. JOE ZINC, IS A COAL (2.0% S, 12,500 BTU/LB) FIRED BOILER LOCATED IN MONACA, PENNSYLVANIA. THE BUREAU OF MINES RETROFITTED A PROTOTYPE CITRATE FGD SYSTEM ON THIS UNIT, WHICH PROVIDES POWER FOR THE LOCAL UTILITY GRID. ONE VENTURI SCRUBBER/ABSORBER TRAIN FOLLOWS A COLD SIDE ESP. TWO CHEVRON MIST ELIMINATORS ARE FOLLOWED BY A COMBINATION OF INDIRECT HOT AIR AND DIRECT COMBUSTION REHEATERS, AND A 102 FOOT FIBERGLASS LINED SCRUBBER STACK. THE SYSTEM SO2 REMOVAL EFFICIENCY WILL BE OVER 90%. THE WATER LOOP IS CLOSED LOOP MODE. THE FGD SYSTEM COMMENCED OPERATION IN NOVEMBER 1979.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
SUNFLOWER ELECTRIC COOP HOLCOMB 1 NEW 347 MW (GROSS) 347 MW (ESC) COAL .47 %S SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: .9% STATUS 3 STARTUP 9/83	SUNFLOWER ELECTRIC COOP'S HOLCOMB 1 STATION IS A PLANNED 347 MW UNIT TO BE LOCATED IN HOLCOMB, KANSAS. THE PULVERIZED COAL (0.47% S, 8800 BTU/LB) FIRED BABCOCK AND WILCOX BOILER WILL UTILIZE A JOY MANUFACTURING/NIRO ATOMIZER DRY SCRUBBING PROCESS FOR SO2 CONTROL. A FABRIC FILTER WILL BE UTILIZED FOR PRIMARY PARTICLE CONTROL. THE UNIT IS SCHEDULED TO COMMENCE OPERATIONS IN THE FALL OF 1983.
TAMPA ELECTRIC BIG BEND 4 NEW 475 MW (GROSS) 475 MW (ESC) COAL 2.35 %S LIME/LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 2.1% STATUS 3 STARTUP 3/85	UNIT 4 AT TAMPA ELECTRIC'S BIG BEND STATION IS A PLANNED DRY BOTTOM PULVERIZED COAL (2.35% S, 10,300 BTU/LB) FIRED UNIT TO BE LOCATED IN TAMPA, FLORIDA. A CONTRACT HAS BEEN AWARDED TO RESEARCH-COTTRELL FOR A WET LIME/LIMESTONE SCRUBBING PROCESS. AN ESP WILL PROVIDE PRIMARY PARTICULATE CONTROL. THE FGD SYSTEM, WHICH WILL REMOVE 90% OF THE FLUE GAS SO2, WILL INCLUDE AN INDIRECT HOT AIR REHEATER LEADING TO A 490 FOOT CONCRETE LINED STACK. THE UNIT WILL PRODUCE GYPSUM AS A SALEABLE PRODUCT.
TENNESSEE VALLEY AUTHORITY PARADISE 1 RETROFIT 704 MW (GROSS) 704 MW (ESC) COAL 4.20 %S LIMESTONE CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 3/82	PARADISE 1 OF TVA IS A 4.2% SULFUR COAL FIRED UNIT LOCATED IN PARADISE, KENTUCKY. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR AN 84.2% EFFICIENT LIMESTONE FGD SYSTEM TO BE RETROFITTED ON THIS BOILER. SIX VENTURI SCRUBBERS AND VENTURI ABSORBER TRAINS WILL FOLLOW AN ESP. INLET FLUE GAS WILL BE USED TO HEAT WATER, WHICH IN TURN WILL BE USED TO REHEAT THE OUTLET FLUE GAS. FORCED OXIDATION WILL BE USED IN ONE MODULE TO CONTROL SCALING THROUGHOUT THE SYSTEM. THE UTILITY EXPECTS TO GET AN 80% SOLIDS LANDFILLABLE GRADE SLUDGE. OPERATIONS SHOULD START IN MARCH 1982.
TENNESSEE VALLEY AUTHORITY PARADISE 2 RETROFIT 704 MW (GROSS) 704 MW (ESC) COAL 4.20 %S LIMESTONE CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/82	PARADISE 2 OF TVA IS A 4.2% SULFUR COAL FIRED UNIT LOCATED IN PARADISE, KENTUCKY. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR AN 84.2% EFFICIENT LIMESTONE FGD SYSTEM TO BE RETROFITTED ON THIS BOILER. SIX VENTURI SCRUBBERS AND VENTURI ABSORBER TRAINS WILL FOLLOW AN ESP. INLET FLUE GAS WILL BE USED TO HEAT WATER, WHICH IN TURN WILL BE USED TO REHEAT THE OUTLET FLUE GAS. FORCED OXIDATION WILL BE USED IN ONE MODULE TO CONTROL SCALING THROUGHOUT THE SYSTEM. THE UTILITY EXPECTS TO GET AN 80% SOLIDS LANDFILLABLE GRADE SLUDGE. OPERATIONS SHOULD START IN JUNE 1982.
TENNESSEE VALLEY AUTHORITY SHAWNEE 10A RETROFIT 10 MW (GROSS) 10 MW (ESC) COAL 2.90 %S BITUMINOUS LIME/LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/72	SHAWNEE 10 OF TVA IS A 2.9% SULFUR BITUMINOUS COAL FIRED BOILER LOCATED IN PADUCAH, KENTUCKY. MODULE 10A IS A RETROFIT PROTOTYPE LIME/LIMESTONE TCA SYSTEM SUPPLIED BY THE AIR CORRECTION DIVISION, UOP. THE SYSTEM UTILIZES A CHEVRON MIST ELIMINATOR AND A DIRECT COMBUSTION REHEATER, AND OPERATES IN A CLOSED WATER LOOP. THIS TEST PROGRAM IS FUNDED BY THE EPA WITH TVA AS THE CONSTRUCTOR AND FACILITY OPERATOR. THE BECHTEL CORP. OF SAN FRANCISCO IS THE MAJOR CONTRACTOR, TEST DIRECTOR, AND REPORT WRITER. THE SYSTEM HAS BEEN OPERATIONAL SINCE APRIL 1972.
TENNESSEE VALLEY AUTHORITY SHAWNEE 10B RETROFIT 10 MW (GROSS) 10 MW (ESC) COAL 2.90 %S BITUMINOUS LIME/LIMESTONE CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/72	SHAWNEE 10 OF TVA IS A 2.9% SULFUR BITUMINOUS COAL FIRED BOILER LOCATED IN PADUCAH, KENTUCKY. MODULE 10B IS A RETROFIT PROTOTYPE LIME/LIMESTONE VENTURI SCRUBBER/SPRAY TOWER ABSORBER SUPPLIED BY CHEMICO. THE SYSTEM, OPERATIONAL SINCE APRIL 1972, INCLUDES A CHEVRON MIST ELIMINATOR AND A DIRECT COMBUSTION REHEATER, AND OPERATES IN A CLOSED WATER LOOP. THIS TEST PROGRAM IS FUNDED BY THE EPA WITH TVA AS THE CONSTRUCTOR AND FACILITY OPERATOR. THE BECHTEL CORP. OF SAN FRANCISCO IS THE MAJOR CONTRACTOR, TEST DIRECTOR, AND REPORT WRITER.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK 7 RETROFIT 575 MW (GROSS) 575 MW (ESC) COAL 3.70 %S BITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 2/81	WIDOWS CREEK 7 IS A PULVERIZED BITUMINOUS COAL (3.7% S, 11,100 BTU/LB) FIRED BOILER OF TVA LOCATED IN BRIDGEPORT, ALABAMA. COMBUSTION ENGINEERING IS PRESENTLY RETROFITTING A LIMESTONE VENTRI ROD SCRUBBER/SPRAY TOWER ABSORBER FGD SYSTEM ON THIS UNIT. AN ESP WILL PRECEDE THE SCRUBBING TRAIN, AND A COMBINATION OF A BULK ENTRAINMENT SEPARATOR, TWO CHEVRON MIST ELIMINATORS AND A FINNED TUBE REHEATER FOLLOW THE SYSTEM. THE SCRUBBER SLUDGE WILL BE DISPOSED IN A SLUDGE POND. CONSTRUCTION BEGAN IN SEPTEMBER 1978, AND START UP IS EXPECTED IN FEBRUARY 1981.
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK 8 RETROFIT 550 MW (GROSS) 550 MW (ESC) COAL 3.70 %S LIMESTONE TENNESSEE VALLEY AUTHORITY ENERGY CONSUMPTION: 4.7% STATUS 1 STARTUP 5/77	WIDOWS CREEK 8 OF TVA IS A BALANCED DRAFT, TANGENTIALLY FIRED COAL (3.7% S, 10,000 BTU/LB) BOILER IN BRIDGEPORT, ALABAMA. TVA RETROFITTED THIS UNIT WITH A LIMESTONE FGD SYSTEM (80% DESIGN SO2 REMOVAL EFFICIENCY) WHICH BEGAN OPERATIONS IN MAY 1977. AN ESP PRECEDES FOUR VARIABLE THROAT VENTURI SCRUBBER/MULTIGRID TOWER ABSORBER TRAINS (ONE OF THE TOWERS IS PACKED). ONE VERTICAL CHEVRON/TRAIN AND AN INDIRECT HOT AIR REHEATER ARE INCLUDED IN THE SYSTEM. SLUDGE FROM THE FGD SYSTEM IS PONDED.
TEXAS MUNICIPAL POWER AGENCY GIBBONS CREEK 1 NEW 443 MW (GROSS) 400 MW (ESC) COAL 1.06 %S LIGNITE LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.4% STATUS 2 STARTUP 1/82	GIBBONS CREEK 1 OF THE TEXAS MUNICIPAL POWER AGENCY IS A DRY BOTTOM PULVERIZED LIGNITE (1.06% S, 4860 BTU/LB) FIRED UNIT PLANNED FOR LOCATION IN CARLOS, TEXAS. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A COLD SIDE ESP FOLLOWED BY THREE 50% CAPACITY LIMESTONE SPRAY TOWERS. A CONTRACT HAS BEEN AWARDED TO COMBUSTION ENGINEERING FOR THE FGD SYSTEM, WHICH INCLUDES A CHEVRON MIST ELIMINATOR AND A STEAM COIL REHEATER. CLEANED FLUE GAS WILL BE DISCHARGED THROUGH A 465 FOOT ACID BRICK LINED STACK. THE POZ-O-TEC STABILIZED SLUDGE WILL BE USED AS STRIP MINE LANDFILL. START UP IS EXPECTED IN JANUARY 1982.
TEXAS POWER & LIGHT SANDOW 4 NEW 545 MW (GROSS) 382 MW (ESC) COAL 1.60 %S LIGNITE LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 12/80	SANDOW 4 IS A PULVERIZED 1.6% SULFUR LIGNITE FIRED BOILER OF TEXAS POWER AND LIGHT LOCATED IN ROCKDALE, TEXAS. COMBUSTION ENGINEERING HAS SUPPLIED THREE LIMESTONE SPRAY TOWERS FOR THIS UNIT. A COLD SIDE ESP IS PROVIDING PRIMARY PARTICULATE CONTROL. A 30% BYPASS REHEAT IS BEING USED, AND THE OVERALL SO2 REMOVAL EFFICIENCY IS 75%. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE SLUDGE IS BEING PONDED. OPERATIONS COMMENCED IN DECEMBER 1980.
TEXAS POWER & LIGHT TWIN OAKS 1 NEW 750 MW (GROSS) 750 MW (ESC) COAL .70 %S LIGNITE LIMESTONE CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 8/84	TWIN OAKS 1 IS A 0.70% SULFUR LIGNITE FIRED BOILER PLANNED BY TEXAS POWER AND LIGHT AND ALCOA FOR LOCATION IN BREMOND, TEXAS. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIMESTONE FGD SYSTEM ON THIS UNIT. START UP IS EXPECTED IN AUGUST 1984.
TEXAS POWER & LIGHT TWIN OAKS 2 NEW 750 MW (GROSS) 750 MW (ESC) COAL .70 %S LIGNITE LIMESTONE CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 8/85	TWIN OAKS 2 IS A 0.70% SULFUR LIGNITE FIRED BOILER PLANNED BY TEXAS POWER AND LIGHT AND ALCOA FOR LOCATION IN BREMOND, TEXAS. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIMESTONE FGD SYSTEM ON THIS UNIT. START UP IS EXPECTED IN AUGUST 1985.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
TEXAS UTILITIES FOREST GROVE 1 NEW 750 MW (GROSS) 750 MW (ESC) COAL .80 %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/87	TEXAS UTILITIES IS PLANNING A LIGNITE (0.8% S, 7000 BTU/LB) FIRED BOILER, FOREST GROVE 1, WHICH WILL BE LOCATED IN ATHENS, TEXAS. THE UTILITY IS PRESENTLY REQUESTING BIDS ON AN FGD SYSTEM FOR THIS UNIT. TWO ESP'S WILL PROVIDE PRIMARY PARTICULATE CONTROL, AND NO STACK GAS REHEAT IS PLANNED. START UP IS EXPECTED IN LATE 1987.
TEXAS UTILITIES MARTIN LAKE 1 NEW 793 MW (GROSS) 595 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 4/77	TEXAS UTILITIES' MARTIN LAKE 1 IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER IN TATUM, TEXAS. THIS UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES A COLD SIDE ESP AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH COTTRELL. THE FGD SYSTEM CONSISTS OF SIX PACKED SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. THE TOTAL DESIGN SO2 REMOVAL EFFICIENCY IS 70.5%. TWO CHEVRONS/MODULE PROVIDE MIST ELIMINATION. THE FLUE GAS CLEANING WASTES ARE FLYASH STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. INITIAL SYSTEM OPERATIONS TOOK PLACE IN APRIL 1977.
TEXAS UTILITIES MARTIN LAKE 2 NEW 793 MW (GROSS) 595 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 5/78	TEXAS UTILITIES' MARTIN LAKE 2 IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER IN TATUM, TEXAS. THIS UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES A COLD SIDE ESP AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH COTTRELL. THE FGD SYSTEM CONSISTS OF SIX PACKED SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. THE TOTAL DESIGN SO2 REMOVAL EFFICIENCY IS 70.5%. TWO CHEVRONS/MODULE PROVIDE MIST ELIMINATION. THE FLUE GAS CLEANING WASTES ARE FLYASH STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. INITIAL SYSTEM OPERATIONS TOOK PLACE IN MAY 1978.
TEXAS UTILITIES MARTIN LAKE 3 NEW 793 MW (GROSS) 595 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 2/79	TEXAS UTILITIES' MARTIN LAKE 3 IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER IN TATUM, TEXAS. THIS UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES A COLD SIDE ESP AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH COTTRELL. THE FGD SYSTEM CONSISTS OF SIX PACKED SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. THE TOTAL DESIGN SO2 REMOVAL EFFICIENCY IS 70.5%. TWO CHEVRONS/MODULE PROVIDE MIST ELIMINATION. THE FLUE GAS CLEANING WASTES ARE FLYASH STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL. THE SYSTEM OPERATES IN A CLOSED WATER LOOP. INITIAL SYSTEM OPERATIONS TOOK PLACE IN FEBRUARY 1979.
TEXAS UTILITIES MARTIN LAKE 4 NEW 750 MW (GROSS) 750 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH-COTTRELL ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/85	MARTIN LAKE 4 OF TEXAS UTILITIES IS A LIGNITE (0.9% S, 7380 BTU/LB) FIRED BOILER UNDER CONSTRUCTION IN TATUM, TEXAS. A CONTRACT FOR A LIMESTONE FGD SYSTEM FOR THIS UNIT HAS BEEN AWARDED TO RESEARCH COTTRELL. CONSTRUCTION HAS NOT YET BEGUN ON THE FGD SYSTEM. FGD START UP IS EXPECTED IN 1985 OR 1986.
TEXAS UTILITIES MILL CREEK 1 NEW 750 MW (GROSS) 750 MW (ESC) COAL ***** %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/85	MILL CREEK 1 OF TEXAS UTILITIES IS A PLANNED LIGNITE FIRED UNIT TO BE LOCATED IN HENDERSON, TEXAS. THE UTILITY WILL INCLUDE AN FGD SYSTEM ON THIS UNIT, BUT NO DECISIONS HAVE BEEN MADE AS TO THE PROCESS TYPE OR VENDOR. ESP'S WILL PROVIDE PRIMARY PARTICLE CONTROL. START UP IS EXPECTED IN 1985.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
TEXAS UTILITIES MILL CREEK 2 NEW 750 MW (GROSS) 750 MW (ESC) COAL ***** %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/86	MILL CREEK 2 OF TEXAS UTILITIES IS A PLANNED LIGNITE FIRED UNIT TO BE LOCATED IN HENDERSON, TEXAS. THE UTILITY WILL INCLUDE AN FGD SYSTEM ON THIS UNIT, BUT NO DECISIONS HAVE BEEN MADE AS TO THE PROCESS TYPE OR VENDOR. ESP'S WILL PROVIDE PRIMARY PARTICLE CONTROL. START UP IS EXPECTED IN 1986.
TEXAS UTILITIES MONTICELLO 3 NEW 800 MW (GROSS) 800 MW (ESC) COAL 1.50 %S LIGNITE LIMESTONE CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/78	MONTICELLO 3 OF TEXAS UTILITIES IS A LIGNITE (1.5% S, 7000 BTU/LB) FIRED UNIT IN MT. PLEASANT, TEXAS. THIS UNIT'S EMISSION CONTROL SYSTEM CONSISTS OF TWO COLD SIDE ESP'S FOLLOWED BY THREE CHEMICO LIMESTONE SPRAY TOWERS (74% DESIGN SO2 REMOVAL EFFICIENCY), ONE HORIZONTAL CHEVRON MIST ELIMINATOR/MODULE, AND AN INDIRECT HOT AIR REHEATER. THE WATER LOOP IS CLOSED, AND THE FLYASH STABILIZED SLUDGE IS DISPOSED IN AN ON SITE LANDFILL. THIS SYSTEM HAS BEEN OPERATIONAL SINCE MAY 1978.
TUCSON ELECTRIC POWER SPRINGERVILLE 1 NEW 370 MW (GROSS) 370 MW (ESC) COAL .61 %S SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 1/85	TUCSON ELECTRIC POWER WILL BE BUILDING TWO NEW UNITS IN SPRINGERVILLE, ARIZONA, SPRINGERVILLE 1 AND 2. THE UNITS WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.53-0.69% S AND 8500-8900 BTU/LB). A CONTRACT HAS BEEN AWARDED TO JOY MANUFACTURING/NIRO ATOMIZER FOR A LIME/SPRAY DRYING FGD SYSTEM TO CONTROL PARTICULATE MATTER AND SO2 EMISSIONS. THE SYSTEM WILL BE DESIGNED TO ACCOMODATE A REHEATER (SHOULD ONE BE REQUIRED) AND WILL OPERATE IN A CLOSED WATER LOOP. CLEANED FLUE GAS WILL EXIT THE SYSTEM VIA A 500 FOOT CONCRETE STACK. STARTUP IS SCHEDULED FOR JANUARY 1985.
TUCSON ELECTRIC POWER SPRINGERVILLE 2 NEW 370 MW (GROSS) 370 MW (ESC) COAL .61 %S SUBBITUMINOUS LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 3/87	TUCSON GAS AND ELECTRIC WILL BE BUILDING TWO NEW UNITS IN SPRINGERVILLE, ARIZONA, SPRINGERVILLE 1 AND 2. THE UNITS WILL FIRE PULVERIZED SUBBITUMINOUS COAL (0.53-0.69% S AND 8500-8900 BTU/LB). A CONTRACT HAS BEEN AWARDED TO JOY MANUFACTURING/NIRO ATOMIZER FOR A LIME/SPRAY DRYING FGD SYSTEM TO CONTROL PARTICULATE MATTER AND SO2 EMISSIONS. THE SYSTEM WILL BE DESIGNED TO ACCOMODATE A REHEATER (SHOULD ONE BE REQUIRED) AND WILL OPERATE IN A CLOSED WATER LOOP. CLEANED FLUE GAS WILL EXIT THE SYSTEM VIA A 500 FOOT CONCRETE STACK. STARTUP IS SCHEDULED FOR MARCH 1987.
UNITED POWER ASSOCIATION STANTON 1A NEW 60 MW (GROSS) 50 MW (ESC) COAL .77 %S LIGNITE LIME/SPRAY DRYING RESEARCH-COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/82	STANTON 1A OF THE UNITED POWER ASSOCIATION IS A PULVERIZED COAL (0.77% S, 7000 BTU/LB) FIRED UNIT UNDER CONSTRUCTION IN STANTON, NORTH DAKOTA. A CONTRACT HAS BEEN AWARDED TO KOMLINE AND SANDERSON FOR A LIME SPRAY DRYER. A FABRIC FILTER SUPPLIED BY RESEARCH COTTRELL WILL BE DESIGNED TO REMOVE 99% OF THE PARTICULATE. THE SYSTEM WILL OPERATE IN AN OPEN LOOP MODE WITH SLUDGE DISPOSAL TO BE IN A CLAY LINED SETTLING POND. OPERATIONS ARE SCHEDULED TO COMMENCE IN JUNE 1982.
UTAH POWER & LIGHT HUNTER 1 NEW 400 MW (GROSS) 360 MW (ESC) COAL .55 %S BITUMINOUS LIME CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/79	HUNTER 1 OF UTAH POWER AND LIGHT IS A COAL (0.55% S, 12,500 BTU/LB) FIRED UNIT IN CASTLEDALE, UTAH. CHEMICO SUPPLIED A PEBBLE LIME WET SCRUBBING SYSTEM WHICH BECAME OPERATIONAL IN MAY 1979. THE SCRUBBING SYSTEM IS DESIGNED TO OPERATE IN AN OPEN WATER LOOP WITH AN SO2 REMOVAL EFFICIENCY OF 80%. PRIMARY PARTICULATE CONTROL IS PROVIDED BY AN UPSTREAM ESP, AND STACK GAS REHEAT IS PROVIDED BY BYPASS. THE SLUDGE IS FLYASH STABILIZED AND DISPOSED ON-SITE.

UNIT IDENTIFICATION	ABSTRACT
UTAH POWER & LIGHT HUNTER 2 NEW 400 MW (GROSS) 360 MW (ESC) COAL .55 %S LIME CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 6/80	UTAH POWER AND LIGHT'S HUNTER 2 IS A COAL (0.55% S, 12,500 BTU/LB) FIRED UNIT LOCATED IN CASTLEDALE, UTAH. FOR EMISSION CONTROL, CHEMICO SUPPLIED A PEBBLE LIME WET SCRUBBING SYSTEM DESIGNED TO OPERATE IN AN OPEN WATER LOOP WITH AN SO2 REMOVAL EFFICIENCY OF 80%. AN UPSTREAM ESP PROVIDES PRIMARY PARTICLE CONTROL, AND A BYPASS SYSTEM PROVIDES STACK GAS REHEAT. THE SLUDGE IS FLYASH STABILIZED AND DISPOSED OF ON-SITE. START UP OF BOTH THE BOILER AND FGD SYSTEM TOOK PLACE IN JUNE 1980.
UTAH POWER & LIGHT HUNTER 3 NEW 400 MW (GROSS) 400 MW (ESC) COAL .55 %S BITUMINOUS LIMESTONE CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 6/83	UTAH POWER AND LIGHT HAS PLANS FOR TWO NEW UNITS, HUNTER 3 AND 4, TO BE CONSTRUCTED IN CASTLEDALE, UTAH. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIMESTONE, NONREGENERABLE FGD UNIT FOR EMISSION CONTROL. THE PULVERIZED COAL FIRED UNIT (0.55% S, 12,500 BTU/LB) IS TO BEGIN OPERATIONS IN JUNE 1983.
UTAH POWER & LIGHT HUNTER 4 NEW 400 MW (GROSS) 400 MW (ESC) COAL .55 %S BITUMINOUS LIMESTONE CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 6/85	UTAH POWER AND LIGHT HAS PLANS FOR TWO NEW UNITS, HUNTER 3 AND 4, TO BE CONSTRUCTED IN CASTLEDALE, UTAH. A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIMESTONE, NONREGENERABLE FGD UNIT FOR EMISSION CONTROL. THE PULVERIZED COAL FIRED UNIT (0.55% S, 12,500 BTU/LB) IS TO BEGIN OPERATIONS IN JUNE 1985.
UTAH POWER & LIGHT HUNTINGTON 1 NEW 430 MW (GROSS) 366 MW (ESC) COAL .55 %S BITUMINOUS LIME CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 5/78	HUNTINGTON 1 OF UTAH POWER IS A TANGENTIALLY FIRED PULVERIZED COAL (0.55% S, 12,500 BTU/LB) BOILER IN PRICE, UTAH. A COLD SIDE ESP TREATS 1,742,000 ACFM OF FLUE GAS AND IS FOLLOWED BY A CHEMICO LIME FGD SYSTEM CONSISTING OF FOUR SPRAY TOWERS (80% DESIGN EFFICIENCY). ONE FOUR PASS CHEVRON/MODULE PROVIDES MIST ELIMINATION, AND A COMBINATION OF A STEAM TUBE AND 10-20% BYPASS REHEATERS BOOST THE GAS TEMPERATURE 45-50 DEG F. THE SYSTEM OPERATES IN A CLOSED WATER LOOP, AND THE FLYASH STABILIZED SLUDGE IS TRUCKED TO AN ON-SITE LANDFILL. THE SYSTEM INCLUDES A 600 FOOT ACID BRICK LINED STACK, AND HAS BEEN OPERATIONAL SINCE MAY 1978.
UTAH POWER & LIGHT NAUGHTON 3 RETROFIT 330 MW (GROSS) 330 MW (ESC) COAL .55 %S SUBBITUMINOUS SODIUM CARBONATE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 1.5% STATUS 2 STARTUP 6/81	NAUGHTON 3 OF UTAH POWER AND LIGHT IS A PULVERIZED COAL (.5% S, 9500 BTU/LB) FIRED BOILER LOCATED IN KEMMERER, WYOMING. THE BOILER SUPPLIES 1,500,000 ACFM OF FLUE GAS TO AN ESP FOR PARTICULATE CONTROL. THE UNIT IS CURRENTLY BEING RETROFITTED WITH A UOP WET SODA ASH FGD SYSTEM FOR SO2 CONTROL. THE FGD SYSTEM IS DESIGNED TO REMOVE 70% OF THE SO2 BEFORE THE FLUE GAS EXITS OUT A 475 FOOT STACK. INITIAL STARTUP IS SCHEDULED FOR JUNE 1981.
WASHINGTON WATER POWER CRESTON COAL 1 NEW 570 MW (GROSS) 570 MW (ESC) COAL ***** %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/87	WASHINGTON WATER POWER HAS PLANS FOR A NEW UNIT, CRESTON COAL 1, TO BE LOCATED IN CRESTON, WASHINGTON. THE COAL FIRED BOILER WILL HAVE A GROSS GENERATING CAPACITY OF 570 MW AND WILL UTILIZE A WET LIMESTONE FGD SYSTEM FOR CONTROL OF SO2 EMISSIONS. FGD OPERATIONS ARE SCHEDULED TO COMMENCE IN 1987.

UNIT IDENTIFICATION	ABSTRACT
WEST PENN POWER MITCHELL 33 RETROFIT 300 MW (GROSS) 300 MW (ESC) COAL 2.80 %S BITUMINOUS LIME CHEMICO DIVISION, ENVIROTECH ENERGY CONSUMPTION: 1.0% STATUS 3 STARTUP 8/82	UNIT 33 AT ALLEGHENY POWER SYSTEM'S MITCHELL POWER STATION IN COURTNEY, PENNSYLVANIA IS A 2.8% SULFUR COAL FIRED BOILER. A CONTRACT WAS AWARDED TO CHEMICO FOR A LIME SCRUBBING PROCESS. SO2 REMOVAL EFFICIENCY WILL BE 95%. START UP IS PLANNED FOR AUGUST 1982.
WEST TEXAS UTILITIES OKLAUNION 1 NEW 720 MW (GROSS) 720 MW (ESC) COAL .34 %S SUBBITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 12/86	WEST TEXAS UTILITIES HAS PLANS TO BUILD TWO PULVERIZED COAL FIRED BOILERS TO BE LOCATED NEAR OKLAUNION, TEXAS. THE UTILITY IS REQUESTING BIDS FOR AN FGD SYSTEM FOR EMISSION CONTROL FROM THE 720 MW UNIT. THE OKLAUNION 1 PLANT IS SCHEDULED TO COMMENCE OPERATIONS IN 1986.
WEST TEXAS UTILITIES OKLAUNION 2 NEW 720 MW (GROSS) 720 MW (ESC) COAL .34 %S SUBBITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/90	WEST TEXAS UTILITIES HAS PLANS TO BUILD TWO PULVERIZED COAL FIRED BOILERS TO BE LOCATED NEAR OKLAUNION, TEXAS. THE UTILITY WILL INCLUDE AN FGD SYSTEM FOR EMISSION CONTROL FROM THE 720 MW UNIT. THE OKLAUNION 2 PLANT IS SCHEDULED TO COMMENCE OPERATIONS IN 1990.

SECTION 4
SUMMARY OF FGD SYSTEMS BY COMPANY

			STATUS							
	TOTAL		OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED		PLANNED	
COMPANY NAME	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
ALABAMA ELECTRIC COOP	2	358.	2	358.	0	0.	0	0.	0	0.
ARIZONA ELECTRIC POWER COOP	2	196.	2	196.	0	0.	0	0.	0	0.
ARIZONA PUBLIC SERVICE	8	2598.	5	962.	1	126.	2	1510.	0	0.
ASSOCIATED ELECTRIC COOP	1	670.	0	0.	1	670.	0	0.	0	0.
ATLANTIC CITY ELECTRIC	1	330.	0	0.	0	0.	0	0.	1	330.
BASIN ELECTRIC POWER COOP	5	2590.	1	570.	3	1580.	0	0.	1	440.
BIG RIVERS ELECTRIC	4	1364.	2	484.	0	0.	2	880.	0	0.
CAJUN ELECTRIC POWER COOP	6	3240.	0	0.	0	0.	0	0.	6	3240.
CENTRAL ILLINOIS LIGHT	2	866.	1	416.	0	0.	0	0.	1	450.
CENTRAL ILLINOIS PUBLIC SERV	1	617.	1	617.	0	0.	0	0.	0	0.
CENTRAL MAINE POWER	1	600.	0	0.	0	0.	0	0.	1	600.
CENTRAL POWER & LIGHT	1	720.	0	0.	0	0.	0	0.	1	720.
CINCINNATI GAS & ELECTRIC	2	1300.	0	0.	1	650.	0	0.	1	650.
COLORADO UTE ELECTRIC ASSN	3	1294.	2	847.	0	0.	1	447.	0	0.
COLUMBUS & SOUTHERN OHIO ELEC	4	1572.	2	822.	0	0.	0	0.	2	750.
COMMONWEALTH EDISON	1	450.	1	450.	0	0.	0	0.	0	0.
COOPERATIVE POWER ASSOCIATION	2	654.	2	654.	0	0.	0	0.	0	0.
DELMARVA POWER & LIGHT	4	730.	3	180.	0	0.	0	0.	1	550.
DESERET GEN & TRANS COOP	2	820.	0	0.	0	0.	1	410.	1	410.
DUQUESNE LIGHT	2	918.	2	918.	0	0.	0	0.	0	0.
EAST KENTUCKY POWER COOP	3	1800.	0	0.	1	500.	0	0.	2	1300.
FLORIDA POWER & LIGHT	2	1600.	0	0.	0	0.	0	0.	2	1600.
GENERAL PUBLIC UTILITIES	5	3190.	0	0.	0	0.	0	0.	5	3190.
GRAND HAVEN BRD OF LIGHT & PWR	1	65.	0	0.	1	65.	0	0.	0	0.
GULF POWER	1	20.	1	20.	0	0.	0	0.	0	0.
HOOSIER ENERGY	2	882.	0	0.	2	882.	0	0.	0	0.
HOUSTON LIGHTING & POWER	3	1992.	0	0.	1	492.	2	1500.	0	0.
INDIANAPOLIS POWER & LIGHT	5	3012.	1	532.	1	530.	0	0.	3	1950.
IOWA ELECTRIC LIGHT & PWR	1	720.	0	0.	0	0.	0	0.	1	720.
JACKSONVILLE ELEC AUTHORITY	2	1200.	0	0.	0	0.	0	0.	2	1200.
KANSAS CITY POWER & LIGHT	3	1000.	3	1000.	0	0.	0	0.	0	0.
KANSAS POWER & LIGHT	4	1575.	4	1575.	0	0.	0	0.	0	0.
KENTUCKY UTILITIES	3	1364.	1	64.	0	0.	0	0.	2	1300.
LAKELAND UTILITIES	1	364.	0	0.	1	364.	0	0.	0	0.
LANSING BOARD OF WATER & LIGHT	1	160.	0	0.	0	0.	0	0.	1	160.
LOS ANGELES DEPT OF WTR & PWR	4	3280.	0	0.	0	0.	0	0.	4	3280.
LOUISVILLE GAS & ELECTRIC	10	3554.	6	1559.	2	845.	0	0.	2	1150.
LOWER COLORADO RIVER AUTH	1	435.	0	0.	0	0.	0	0.	1	435.
MARQUETTE BOARD OF LIGHT & PWR	1	31.	0	0.	0	0.	1	31.	0	0.
MICHIGAN SO CENTRAL PWR AGENCY	1	55.	0	0.	1	55.	0	0.	0	0.
MIDDLE SOUTH UTILITIES	6	5340.	0	0.	0	0.	0	0.	6	5340.
MINNESOTA POWER & LIGHT	1	475.	1	475.	0	0.	0	0.	0	0.
MINNKOTA POWER COOPERATIVE	1	185.	1	185.	0	0.	0	0.	0	0.
MONONGAHELA POWER	2	1236.	2	1236.	0	0.	0	0.	0	0.
MONTANA POWER	4	2120.	2	720.	2	1400.	0	0.	0	0.
MONTANA-DAKOTA UTILITIES	1	440.	0	0.	1	440.	0	0.	0	0.
MUSCATINE POWER & WATER	1	166.	0	0.	0	0.	1	166.	0	0.
NEBRASKA PUBLIC POWER DISTRICT	1	650.	0	0.	0	0.	0	0.	1	650.
NEVADA POWER	10	3215.	3	375.	0	0.	0	0.	7	2840.
NEW YORK STATE ELEC & GAS	1	625.	0	0.	0	0.	0	0.	1	625.
NIAGARA MOHAWK POWER COOP	1	100.	0	0.	1	100.	0	0.	0	0.
NORTHERN INDIANA PUB SERVICE	3	957.	1	115.	0	0.	2	842.	0	0.
NORTHERN STATES POWER	6	3310.	3	1590.	0	0.	0	0.	3	1720.
PACIFIC GAS & ELECTRIC	2	1600.	0	0.	0	0.	0	0.	2	1600.
PACIFIC POWER & LIGHT	4	2200.	1	550.	0	0.	0	0.	3	1650.
PENNSYLVANIA POWER	3	2751.	3	2751.	0	0.	0	0.	0	0.
PHILADELPHIA ELECTRIC	3	724.	0	0.	3	724.	0	0.	0	0.
PLAINS ELECTRIC G & T COOP	1	233.	0	0.	0	0.	1	233.	0	0.
PLATTE RIVER POWER AUTHORITY	1	279.	0	0.	0	0.	1	279.	0	0.
PUBLIC SERVICE INDIANA	1	650.	0	0.	1	650.	0	0.	0	0.

NOTE - PLANNED STATUS INCLUDES LETTER OF INTENT SIGNED, REQUESTING/EVALUATING BIDS, AND CONSIDERING ONLY FGD SYSTEMS

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SECTION 4
SUMMARY OF FGD SYSTEMS BY COMPANY

	TOTAL		STATUS							
			OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED		PLANNED	
COMPANY NAME	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
PUBLIC SERVICE OF NEW MEXICO	4	1779.	3	1245.	1	534.	0	0.	0	0.
PWR AUTHORITY OF STATE OF NY	1	700.	0	0.	0	0.	0	0.	1	700.
SALT RIVER PROJECT	3	840.	2	560.	0	0.	0	0.	1	280.
SAN MIGUEL ELECTRIC COOP	1	400.	0	0.	1	400.	0	0.	0	0.
SEMINOLE ELECTRIC	2	1240.	0	0.	0	0.	2	1240.	0	0.
SIKESTON BRD OF MUNICIPAL UTIL	1	235.	0	0.	1	235.	0	0.	0	0.
SOUTH CAROLINA PUBLIC SERVICE	5	1700.	2	420.	1	280.	2	1000.	0	0.
SOUTH MISSISSIPPI ELEC PWR	2	248.	2	248.	0	0.	0	0.	0	0.
SOUTHERN ILLINOIS POWER COOP	2	473.	1	173.	0	0.	0	0.	1	300.
SOUTHERN INDIANA GAS & ELEC	1	265.	1	265.	0	0.	0	0.	0	0.
SOUTHWESTERN ELECTRIC POWER	3	2160.	0	0.	0	0.	2	1440.	1	720.
SOYLAND POWER COOP	1	500.	0	0.	0	0.	0	0.	1	500.
SPRINGFIELD CITY UTILITIES	1	194.	1	194.	0	0.	0	0.	0	0.
SPRINGFIELD WATER, LIGHT & PWR	1	205.	1	205.	0	0.	0	0.	0	0.
ST. JOE ZINC	1	60.	1	60.	0	0.	0	0.	0	0.
SUNFLOWER ELECTRIC COOP	1	347.	0	0.	0	0.	1	347.	0	0.
TAMPA ELECTRIC	1	475.	0	0.	0	0.	1	475.	0	0.
TENNESSEE VALLEY AUTHORITY	6	2553.	3	570.	3	1983.	0	0.	0	0.
TEXAS MUNICIPAL POWER AGENCY	1	400.	0	0.	1	400.	0	0.	0	0.
TEXAS POWER & LIGHT	3	1882.	1	382.	0	0.	2	1500.	0	0.
TEXAS UTILITIES	8	5585.	4	2585.	0	0.	1	750.	3	2250.
TUCSON ELECTRIC POWER	2	740.	0	0.	0	0.	2	740.	0	0.
UNITED POWER ASSOCIATION	1	50.	0	0.	1	50.	0	0.	0	0.
UTAH POWER & LIGHT	6	2216.	3	1086.	1	330.	2	800.	0	0.
WASHINGTON WATER POWER	1	570.	0	0.	0	0.	0	0.	1	570.
WEST PENN POWER	1	300.	0	0.	0	0.	1	300.	0	0.
WEST TEXAS UTILITIES	2	1440.	0	0.	0	0.	0	0.	2	1440.
TOTALS	223	102999.	84	28214.	34	14285.	30	14890.	75	45610.

NOTE - PLANNED STATUS INCLUDES LETTER OF INTENT SIGNED, REQUESTING/EVALUATING BIDS, AND CONSIDERING ONLY FGD SYSTEMS

SECTION 5
SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

			STATUS					
	TOTAL		OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED	
SYSTEM SUPPLIER/PROCESS	NO.	MW	NO.	MW	NO.	MW	NO.	MW
AIR CORRECTION DIVISION, UOP								
LIME	2	822.	2	822.	0	0.	0	0.
LIMESTONE	5	2616.	3	1176.	0	0.	2	1440.
LIME/LIMESTONE	1	10.	1	10.	0	0.	0	0.
SODIUM CARBONATE	2	880.	1	550.	1	330.	0	0.
TOTAL -	10	4328.	7	2558.	1	330.	2	1440.
AMERICAN AIR FILTER								
LIME	6	1673.	5	1178.	1	495.	0	0.
LIMESTONE	1	280.	0	0.	1	280.	0	0.
TOTAL -	7	1953.	5	1178.	2	775.	0	0.
BABCOCK & WILCOX								
LIME	4	1951.	2	1236.	2	715.	0	0.
LIMESTONE	8	2467.	4	1413.	4	1054.	0	0.
LIME/SPRAY DRYING	2	1017.	0	0.	1	570.	1	447.
TOTAL -	14	5435.	6	2649.	7	2339.	1	447.
BUELL DIVISION, ENVIROTECH								
DUAL ALKALI	1	617.	1	617.	0	0.	0	0.
LIME	1	31.	0	0.	0	0.	1	31.
TOTAL -	2	648.	1	617.	0	0.	1	31.
CHEMICO DIVISION, ENVIROTECH								
LIME	8	4138.	7	3838.	0	0.	1	300.
LIMESTONE	8	5000.	1	800.	3	1900.	4	2300.
LIME/ALKALINE FLYASH	3	579.	3	579.	0	0.	0	0.
LIME/LIMESTONE	1	10.	1	10.	0	0.	0	0.
TOTAL -	20	9727.	12	5227.	3	1900.	5	2600.
COMBUSTION ENGINEERING								
LIME	6	1160.	5	810.	1	350.	0	0.
LIMESTONE	11	5075.	5	1957.	2	975.	4	2143.
LIMESTONE/ALKALINE FLYASH	2	1480.	2	1480.	0	0.	0	0.
LIME/ALKALINE FLYASH	2	654.	2	654.	0	0.	0	0.
TOTAL -	21	8369.	14	4901.	3	1325.	4	2143.
COMBUSTION EQUIP ASSOCIATES								
DUAL ALKALI	1	299.	1	299.	0	0.	0	0.
DUAL ALKALI/LIMESTONE	1	20.	1	20.	0	0.	0	0.
LIME	1	500.	0	0.	1	500.	0	0.
LIME/ALKALINE FLYASH	5	2305.	3	905.	2	1400.	0	0.
SODIUM CARBONATE	3	375.	3	375.	0	0.	0	0.
TOTAL -	11	3499.	8	1599.	3	1900.	0	0.
DAVY MCKEE								
WELLMAN LORD	8	2074.	7	1540.	1	534.	0	0.
TOTAL -	8	2074.	7	1540.	1	534.	0	0.
ENVIRONEERING, RILEY STOKER								
LIMESTONE	3	664.	3	664.	0	0.	0	0.
TOTAL -	3	664.	3	664.	0	0.	0	0.
FMC								
DUAL ALKALI	3	1107.	1	265.	0	0.	2	842.
TOTAL -	3	1107.	1	265.	0	0.	2	842.

SECTION 5
SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

			STATUS					
	TOTAL		OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED	
SYSTEM SUPPLIER/PROCESS	NO.	MW	NO.	MW	NO.	MW	NO.	MW
JOY MFG/NIRO ATOMIZER								
LIME/SPRAY DRYING	6	1916.	1	110.	1	440.	4	1366.
TOTAL -	6	1916.	1	110.	1	440.	4	1366.
MITSUBISHI HEAVY INDUSTRIES								
LIMESTONE	2	882.	0	0.	2	882.	0	0.
TOTAL -	2	882.	0	0.	2	882.	0	0.
MORRISON & KNUDSEN/U.S.B.M.								
CITRATE	1	60.	1	60.	0	0.	0	0.
TOTAL -	1	60.	1	60.	0	0.	0	0.
PEABODY PROCESS SYSTEMS								
LIMESTONE	8	3445.	4	1205.	0	0.	4	2240.
LIME/ALKALINE FLYASH	1	475.	1	475.	0	0.	0	0.
TOTAL -	9	3920.	5	1680.	0	0.	4	2240.
PULLMAN KELLOGG								
LIME	1	917.	1	917.	0	0.	0	0.
LIMESTONE	6	2760.	2	560.	2	1320.	2	880.
TOTAL -	7	3677.	3	1477.	2	1320.	2	880.
RESEARCH-COTTRELL								
LIMESTONE	14	5281.	9	3139.	3	1226.	2	916.
LIME/LIMESTONE	1	475.	0	0.	0	0.	1	475.
LIME/SPRAY DRYING	1	50.	0	0.	1	50.	0	0.
TOTAL -	16	5806.	9	3139.	4	1276.	3	1391.
ROCKWELL INTERNATIONAL								
AQUEOUS CARBONATE/SPRAY DRYING	1	100.	0	0.	1	100.	0	0.
TOTAL -	1	100.	0	0.	1	100.	0	0.
TENNESSEE VALLEY AUTHORITY								
LIMESTONE	1	550.	1	550.	0	0.	0	0.
TOTAL -	1	550.	1	550.	0	0.	0	0.
UNITED ENGINEERS								
LIME	2	1510.	0	0.	0	0.	2	1510.
MAGNESIUM OXIDE	3	724.	0	0.	3	724.	0	0.
TOTAL -	5	2234.	0	0.	3	724.	2	1510.
WHEELABRATOR-FRYE/R.I.								
SODIUM CARBONATE/SPRAY DRYING	1	440.	0	0.	1	440.	0	0.
TOTAL -	1	440.	0	0.	1	440.	0	0.
TOTAL -	148	57389.	84	28214.	34	14285.	30	14890.

SECTION 6
SUMMARY OF FGD SYSTEMS BY PROCESS

PROCESS	TOTAL		STATUS							
			OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED		PLANNED	
	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
AQUEOUS CARBONATE/SPRAY DRYING	1	100.	0	0.	1	100.	0	0.	0	0.
CITRATE	1	60.	1	60.	0	0.	0	0.	0	0.
LIME	1	65.	0	0.	1	65.	0	0.	0	0.
LIMESTONE	1	166.	0	0.	0	0.	1	166.	0	0.
LIME/LIMESTONE	1	475.	0	0.	0	0.	1	475.	0	0.
MAGNESIUM OXIDE	3	724.	0	0.	3	724.	0	0.	0	0.
WELLMAN LORD	8	2074.	7	1540.	1	534.	0	0.	0	0.
SUBTOTAL - SALEABLE PRODUCT	16	3664.	8	1600.	6	1423.	2	641.	0	0.
DUAL ALKALI	5	2023.	3	1181.	0	0.	2	842.	0	0.
DUAL ALKALI/LIMESTONE	1	20.	1	20.	0	0.	0	0.	0	0.
LIME	37	17637.	22	8801.	4	1995.	4	1841.	7	5000.
LIMESTONE	78	36189.	32	11464.	17	7637.	17	9753.	12	7335.
LIMESTONE/ALKALINE FLYASH	2	1480.	2	1480.	0	0.	0	0.	0	0.
LIME/ALKALINE FLYASH	11	4013.	9	2613.	2	1400.	0	0.	0	0.
LIME/LIMESTONE	2	20.	2	20.	0	0.	0	0.	0	0.
LIME/SPRAY DRYING	9	2983.	1	110.	3	1060.	5	1813.	0	0.
PROCESS NOT SELECTED	12	6650.	0	0.	0	0.	0	0.	12	6650.
SODIUM CARBONATE	9	3155.	4	925.	1	330.	0	0.	4	1900.
SODIUM CARBONATE/SPRAY DRYING	1	440.	0	0.	1	440.	0	0.	0	0.
SUBTOTAL - THROWAWAY PRODUCT	167	74610.	76	26614.	28	12862.	28	14249.	35	20885.
TOTALS	183	78274.	84	28214.	34	14285.	30	14890.	35	20885.
SALEABLE PRODUCT PROCESS % OF TOTAL MW		5		6		10		4		0

NOTE: 40 UNITS ARE UNDECIDED AND ARE NOT INCLUDED IN THIS TABLE

SECTION 7
SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
CITRATE				
G.F. WEATON	1	60.	11/79	1/80
		60.		
DUAL ALKALI				
NEWTON	1	617.	9/79	12/79
CANE RUN	6	299.	4/79	0/ 0
A.B. BROWN	1	265.	3/79	4/79
		1181.		
DUAL ALKALI/LIMESTONE				
SCHOLZ	1	20.	8/80	0/ 0
		20.		
LIME				
CONESVILLE	5	411.	1/77	2/77
CONESVILLE	6	411.	6/78	7/78
CANE RUN	4	188.	8/76	8/77
GREEN	1	242.	12/79	12/79
GREEN	2	242.	11/80	12/80
GREEN RIVER	1-3	64.	9/75	6/76
MILL CREEK	3	442.	8/78	3/79
PLEASANTS	1	618.	3/79	3/79
PLEASANTS	2	618.	10/80	0/81
BRUCE MANSFIELD	1	917.	12/75	6/76
BRUCE MANSFIELD	2	917.	7/77	10/77
ELRAMA	1-4	510.	10/75	10/75
HUNTER	1	360.	5/79	5/79
HUNTER	2	360.	6/80	6/80
HUNTINGTON	1	366.	5/78	5/78
PHILLIPS	1-6	408.	7/73	6/74
CANE RUN	5	200.	12/77	7/78
HAWTHORN	3	90.	11/72	0/ 0
HAWTHORN	4	90.	8/72	0/ 0
MILL CREEK	1	358.	12/80	4/81
PADDY'S RUN	6	72.	4/73	0/ 0
BRUCE MANSFIELD	3	917.	6/80	6/80
		8801.		
LIMESTONE				
PETERSBURG	3	532.	12/77	12/77
POWERTON	51	450.	4/80	6/81
SOUTHWEST	1	194.	4/77	9/77
LA CYGNE	1	820.	2/73	6/73
MARION	4	173.	5/79	6/79
WINYAH	2	140.	7/77	0/ 0
WINYAH	3	280.	5/80	6/80
MONTICELLO	3	800.	5/78	10/78
JEFFREY	1	540.	8/78	0/ 0
JEFFREY	2	490.	4/80	1/80
LAWRENCE	4	125.	1/77	0/ 0
LAWRENCE	5	420.	4/78	0/ 0
SANDOW	4	382.	12/80	1/81
DUCK CREEK	1	416.	7/76	8/78
R.D. MORROW, SR.	1	124.	8/78	8/78
R.D. MORROW, SR.	2	124.	6/79	6/79
CRAIG	1	447.	10/80	8/80

THIS TABLE IDENTIFIES UNITS IN ALPHABETICAL ORDER.
RESPECTIVE COMPANIES CAN BE FOUND IN SECTION 1.

SECTION 7
SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
CRAIG	2	400.	12/79	5/80
TOMBIGBEE	2	179.	9/78	9/78
TOMBIGBEE	3	179.	6/79	6/79
CORONADO	1	280.	11/79	12/79
CORONADO	2	280.	7/80	10/81
APACHE	2	98.	8/78	1/79
APACHE	3	98.	6/79	4/79
CHOLLA	1	119.	10/73	12/73
CHOLLA	2	264.	4/78	6/78
DALLMAN	3	205.	10/80	1/81
LARAMIE RIVER	1	570.	7/80	7/80
MARTIN LAKE	1	595.	4/77	10/78
MARTIN LAKE	2	595.	5/78	0/ 0
MARTIN LAKE	3	595.	2/79	0/ 0
WIDOWS CREEK	8	550.	5/77	1/78
		11464.		
LIMESTONE/ALKALINE FLYASH				
SHERBURNE	1	740.	3/76	5/76
SHERBURNE	2	740.	3/77	4/77
		1480.		
LIME/ALKALINE FLYASH				
FOUR CORNERS	1	175.	11/79	0/ 0
FOUR CORNERS	2	175.	11/79	0/ 0
FOUR CORNERS	3	229.	11/79	0/ 0
COAL CREEK	1	327.	7/79	8/79
COAL CREEK	2	327.	7/80	9/80
COLSTRIP	1	360.	9/75	11/75
COLSTRIP	2	360.	5/76	10/76
MILTON R. YOUNG	2	185.	9/77	6/78
CLAY BOSWELL	4	475.	4/80	0/ 0
		2613.		
LIME/LIMESTONE				
SHAWNEE	10A	10.	4/72	0/ 0
SHAWNEE	10B	10.	4/72	0/ 0
		20.		
LIME/SPRAY DRYING				
RIVERSIDE	6,7	110.	11/80	12/80
		110.		
SODIUM CARBONATE				
JIM BRIDGER	4	550.	9/79	2/80
REID GARDNER	1	125.	3/74	4/74
REID GARDNER	2	125.	4/74	0/ 0
REID GARDNER	3	125.	7/76	7/76
		925.		
WELLMAN LORD				
DEAN H. MITCHELL	11	115.	7/76	6/77
DELAWARE CITY	1	60.	5/80	5/80
DELAWARE CITY	2	60.	5/80	5/80
DELAWARE CITY	3	60.	5/80	5/80
SAN JUAN	1	361.	4/78	4/78

THIS TABLE IDENTIFIES UNITS IN ALPHABETICAL ORDER.
RESPECTIVE COMPANIES CAN BE FOUND IN SECTION 1.

SECTION 7
SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
SAN JUAN	2	350.	8/78	8/78
SAN JUAN	3	534.	12/79	0/ 0
		1540.		
TOTAL		28214.		

SECTION 8

SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

PROCESS/ UNIT NAME	UNIT NO	THROWAWAY		BYPRODUCT	
		STABILIZED	UNSTABILIZED	TYPE	DISPOSITION
CITRATE					
G.F. WEATON	1			ELEMENTAL SULFUR	
DUAL ALKALI					
NEWTON	1				
CANE RUN	6	LANDFILL			
A.B. BROWN	1	LANDFILL			
DUAL ALKALI/LIMESTONE					
SCHOLZ	1				
LIME					
CONESVILLE	5	POND			
CONESVILLE	6	POND			
CANE RUN	4	LINED POND			
GREEN	1	LANDFILL			
GREEN	2	LANDFILL			
GREEN RIVER	1-3		LINED POND		
MILL CREEK	3	POND			
PLEASANTS	1				
PLEASANTS	2				
BRUCE MANSFIELD	1	LANDFILL			
BRUCE MANSFIELD	2	LANDFILL			
ELRAMA	1-4	LANDFILL			
HUNTER	1	POND			
HUNTER	2	POND			
HUNTINGTON	1	LANDFILL			
PHILLIPS	1-6	LANDFILL			
CANE RUN	5	LINED POND			
HAWTHORN	3	POND			
HAWTHORN	4	POND			
MILL CREEK	1				
PADDY'S RUN	6	POND			
BRUCE MANSFIELD	3				
LIMESTONE					
PETERSBURG	3	LANDFILL			
POWERTON	51	LANDFILL			
SOUTHWEST	1	LANDFILL			
LA CYGNE	1		UNLINED POND		
MARION	4	LANDFILL			
WINYAH	2		POND		
WINYAH	3				
MONTICELLO	3	LANDFILL			
JEFFREY	1	POND			
JEFFREY	2	LINED POND			
LAWRENCE	4	POND			
LAWRENCE	5	POND			
SANDOW	4		POND		
DUCK CREEK	1		LINED POND		
R.D. MORROW, SR.	1	LANDFILL			
R.D. MORROW, SR.	2	LANDFILL			
CRAIG	1		MINEFILL		
CRAIG	2		MINEFILL		
TOMBIGBEE	2	LINED POND			
TOMBIGBEE	3	LINED POND			
CORONADO	1		LINED POND		
CORONADO	2		LINED POND		
APACHE	2		POND		
APACHE	3		POND		
CHOLLA	1		POND		

SECTION 8
SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

PROCESS/		THROWAWAY		BYPRODUCT	
UNIT NAME	UNIT NO	STABILIZED	UNSTABILIZED	TYPE	DISPOSITION
CHOLLA	2		UNLINED POND		
DALLMAN	3		LANDFILL		
LARAMIE RIVER	1	LANDFILL			
MARTIN LAKE	1	LANDFILL			
MARTIN LAKE	2	LANDFILL			
MARTIN LAKE	3	LANDFILL			
WIDOWS CREEK	8		POND		
LIMESTONE/ALKALINE FLYASH					
SHERBURNE	1	LINED POND			
SHERBURNE	2	LINED POND			
LIME/ALKALINE FLYASH					
FOUR CORNERS	1				
FOUR CORNERS	2				
FOUR CORNERS	3				
COAL CREEK	1	LINED POND			
COAL CREEK	2	LINED POND			
COLSTRIP	1		POND		
COLSTRIP	2		POND		
MILTON R. YOUNG	2		MINEFILL		
CLAY BOSWELL	4		LINED POND		
LIME/LIMESTONE					
SHAWNEE	10A				
SHAWNEE	10B				
LIME/SPRAY DRYING					
RIVERSIDE	6,7	LANDFILL			
SODIUM CARBONATE					
JIM BRIDGER	4		LINED POND		
REID GARDNER	1		LINED POND		
REID GARDNER	2		LINED POND		
REID GARDNER	3		LINED POND		
WELLMAN LORD					
DEAN H. MITCHELL	11			ELEMENTAL SULFUR	
DELAWARE CITY	1	LINED POND		SULFURIC ACID	MARKETED
DELAWARE CITY	2	LINED POND		SULFURIC ACID	MARKETED
DELAWARE CITY	3	LINED POND		SULFURIC ACID	MARKETED
SAN JUAN	1			ELEMENTAL SULFUR	MARKETED
SAN JUAN	2			ELEMENTAL SULFUR	MARKETED
SAN JUAN	3			SULFURIC ACID	MARKETED

SECTION 9
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ALABAMA ELECTRIC COOP TOMBIGBEE	2	NEW	179.	LIMESTONE PEABODY PROCESS SYSTEMS	9/78
ALABAMA ELECTRIC COOP TOMBIGBEE	3	NEW	179.	LIMESTONE PEABODY PROCESS SYSTEMS	6/79
ARIZONA ELECTRIC POWER COOP APACHE	2	NEW	98.	LIMESTONE RESEARCH-COTTRELL	8/78
ARIZONA ELECTRIC POWER COOP APACHE	3	NEW	98.	LIMESTONE RESEARCH-COTTRELL	6/79
ARIZONA PUBLIC SERVICE CHOLLA	1	RETROFIT	119.	LIMESTONE RESEARCH-COTTRELL	10/73
ARIZONA PUBLIC SERVICE CHOLLA	2	NEW	264.	LIMESTONE RESEARCH-COTTRELL	4/78
ARIZONA PUBLIC SERVICE FOUR CORNERS	1	RETROFIT	175.	LIME/ALKALINE FLYASH CHEMICO DIVISION, ENVIROTECH	11/79
ARIZONA PUBLIC SERVICE FOUR CORNERS	2	RETROFIT	175.	LIME/ALKALINE FLYASH CHEMICO DIVISION, ENVIROTECH	11/79
ARIZONA PUBLIC SERVICE FOUR CORNERS	3	RETROFIT	229.	LIME/ALKALINE FLYASH CHEMICO DIVISION, ENVIROTECH	11/79
BASIN ELECTRIC POWER COOP LARAMIE RIVER	1	NEW	570.	LIMESTONE RESEARCH-COTTRELL	7/80
BIG RIVERS ELECTRIC GREEN	1	NEW	242.	LIME AMERICAN AIR FILTER	12/79
BIG RIVERS ELECTRIC GREEN	2	NEW	242.	LIME AMERICAN AIR FILTER	11/80
CENTRAL ILLINOIS LIGHT DUCK CREEK	1	NEW	416.	LIMESTONE ENVIRONEERING, RILEY STOKER	7/76
CENTRAL ILLINOIS PUBLIC SERV NEWTON	1	NEW	617.	DUAL ALKALI BUELL DIVISION, ENVIROTECH	9/79
COLORADO UTE ELECTRIC ASSN CRAIG	1	NEW	447.	LIMESTONE PEABODY PROCESS SYSTEMS	10/80
COLORADO UTE ELECTRIC ASSN CRAIG	2	NEW	400.	LIMESTONE PEABODY PROCESS SYSTEMS	12/79
COLUMBUS & SOUTHERN OHIO ELEC CONESVILLE	5	NEW	411.	LIME AIR CORRECTION DIVISION, UOP	1/77
COLUMBUS & SOUTHERN OHIO ELEC CONESVILLE	6	NEW	411.	LIME AIR CORRECTION DIVISION, UOP	6/78
COMMONWEALTH EDISON POWERTON	51	RETROFIT	450.	LIMESTONE AIR CORRECTION DIVISION, UOP	4/80
COOPERATIVE POWER ASSOCIATION COAL CREEK	1	NEW	327.	LIME/ALKALINE FLYASH COMBUSTION ENGINEERING	7/79
COOPERATIVE POWER ASSOCIATION COAL CREEK	2	NEW	327.	LIME/ALKALINE FLYASH COMBUSTION ENGINEERING	7/80
DELMARVA POWER & LIGHT DELAWARE CITY	1	RETROFIT	60.	WELLMAN LORD DAVY MCKEE	5/80
DELMARVA POWER & LIGHT DELAWARE CITY	2	RETROFIT	60.	WELLMAN LORD DAVY MCKEE	5/80

SECTION 9
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
DELMARVA POWER & LIGHT DELAWARE CITY	3	RETROFIT	60.	WELLMAN LORD DAVY MCKEE	5/80
DUQUESNE LIGHT ELRAMA	1-4	RETROFIT	510.	LIME CHEMICO DIVISION, ENVIROTECH	10/75
DUQUESNE LIGHT PHILLIPS	1-6	RETROFIT	408.	LIME CHEMICO DIVISION, ENVIROTECH	7/73
GULF POWER SCHOLZ	1	RETROFIT	20.	DUAL ALKALI/LIMESTONE COMBUSTION EQUIP ASSOCIATES	8/80
INDIANAPOLIS POWER & LIGHT PETERSBURG	3	NEW	532.	LIMESTONE AIR CORRECTION DIVISION, UOP	12/77
KANSAS CITY POWER & LIGHT HAWTHORN	3	RETROFIT	90.	LIME COMBUSTION ENGINEERING	11/72
KANSAS CITY POWER & LIGHT HAWTHORN	4	RETROFIT	90.	LIME COMBUSTION ENGINEERING	8/72
KANSAS CITY POWER & LIGHT LA CYGNE	1	NEW	820.	LIMESTONE BABCOCK & WILCOX	2/73
KANSAS POWER & LIGHT JEFFREY	1	NEW	540.	LIMESTONE COMBUSTION ENGINEERING	8/78
KANSAS POWER & LIGHT JEFFREY	2	NEW	490.	LIMESTONE COMBUSTION ENGINEERING	4/80
KANSAS POWER & LIGHT LAWRENCE	4	RETROFIT	125.	LIMESTONE COMBUSTION ENGINEERING	1/77
KANSAS POWER & LIGHT LAWRENCE	5	RETROFIT	420.	LIMESTONE COMBUSTION ENGINEERING	4/78
KENTUCKY UTILITIES GREEN RIVER	1-3	RETROFIT	64.	LIME AMERICAN AIR FILTER	9/75
LOUISVILLE GAS & ELECTRIC CANE RUN	4	RETROFIT	188.	LIME AMERICAN AIR FILTER	8/76
LOUISVILLE GAS & ELECTRIC CANE RUN	5	RETROFIT	200.	LIME COMBUSTION ENGINEERING	12/77
LOUISVILLE GAS & ELECTRIC CANE RUN	6	RETROFIT	299.	DUAL ALKALI COMBUSTION EQUIP ASSOCIATES	4/79
LOUISVILLE GAS & ELECTRIC MILL CREEK	1	RETROFIT	358.	LIME COMBUSTION ENGINEERING	12/80
LOUISVILLE GAS & ELECTRIC MILL CREEK	3	NEW	442.	LIME AMERICAN AIR FILTER	8/78
LOUISVILLE GAS & ELECTRIC PADDY'S RUN	6	RETROFIT	72.	LIME COMBUSTION ENGINEERING	4/73
MINNESOTA POWER & LIGHT CLAY BOSWELL	4	NEW	475.	LIME/ALKALINE FLYASH PEABODY PROCESS SYSTEMS	4/80
MINNKOTA POWER COOPERATIVE MILTON R. YOUNG	2	NEW	185.	LIME/ALKALINE FLYASH COMBUSTION EQUIP ASSOCIATES	9/77
MONONGAHELA POWER PLEASANTS	1	NEW	618.	LIME BABCOCK & WILCOX	3/79
MONONGAHELA POWER PLEASANTS	2	NEW	618.	LIME BABCOCK & WILCOX	10/80

SECTION 9
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
MONTANA POWER COLSTRIP	1	NEW	360.	LIME/ALKALINE FLYASH COMBUSTION EQUIP ASSOCIATES	9/75
MONTANA POWER COLSTRIP	2	NEW	360.	LIME/ALKALINE FLYASH COMBUSTION EQUIP ASSOCIATES	5/76
NEVADA POWER REID GARDNER	1	RETROFIT	125.	SODIUM CARBONATE COMBUSTION EQUIP ASSOCIATES	3/74
NEVADA POWER REID GARDNER	2	RETROFIT	125.	SODIUM CARBONATE COMBUSTION EQUIP ASSOCIATES	4/74
NEVADA POWER REID GARDNER	3	NEW	125.	SODIUM CARBONATE COMBUSTION EQUIP ASSOCIATES	7/76
NORTHERN INDIANA PUB SERVICE DEAN H. MITCHELL	11	RETROFIT	115.	WELLMAN LORD DAVY MCKEE	7/76
NORTHERN STATES POWER RIVERSIDE	6,7	RETROFIT	110.	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	11/80
NORTHERN STATES POWER SHERBURNE	1	NEW	740.	LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING	3/76
NORTHERN STATES POWER SHERBURNE	2	NEW	740.	LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING	3/77
PACIFIC POWER & LIGHT JIM BRIDGER	4	NEW	550.	SODIUM CARBONATE AIR CORRECTION DIVISION, UOP	9/79
PENNSYLVANIA POWER BRUCE MANSFIELD	1	NEW	917.	LIME CHEMICO DIVISION, ENVIROTECH	12/75
PENNSYLVANIA POWER BRUCE MANSFIELD	2	NEW	917.	LIME CHEMICO DIVISION, ENVIROTECH	7/77
PENNSYLVANIA POWER BRUCE MANSFIELD	3	NEW	917.	LIME PULLMAN KELLOGG	6/80
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	1	RETROFIT	361.	WELLMAN LORD DAVY MCKEE	4/78
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	2	RETROFIT	350.	WELLMAN LORD DAVY MCKEE	8/78
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	3	NEW	534.	WELLMAN LORD DAVY MCKEE	12/79
SALT RIVER PROJECT CORONADO	1	NEW	280.	LIMESTONE PULLMAN KELLOGG	11/79
SALT RIVER PROJECT CORONADO	2	NEW	280.	LIMESTONE PULLMAN KELLOGG	7/80
SOUTH CAROLINA PUBLIC SERVICE WINYAH	2	NEW	140.	LIMESTONE BABCOCK & WILCOX	7/77
SOUTH CAROLINA PUBLIC SERVICE WINYAH	3	NEW	280.	LIMESTONE BABCOCK & WILCOX	5/80
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW, SR.	1	NEW	124.	LIMESTONE ENVIRONEERING, RILEY STOKER	8/78
SOUTH MISSISSIPPI ELEC PWR R.D. MORROW, SR.	2	NEW	124.	LIMESTONE ENVIRONEERING, RILEY STOKER	6/79
SOUTHERN ILLINOIS POWER COOP MARION	4	NEW	173.	LIMESTONE BABCOCK & WILCOX	5/79

SECTION 9
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
SOUTHERN INDIANA GAS & ELEC A.B. BROWN	1	NEW	265.	DUAL ALKALI FMC	3/79
SPRINGFIELD CITY UTILITIES SOUTHWEST	1	NEW	194.	LIMESTONE AIR CORRECTION DIVISION, UOP	4/77
SPRINGFIELD WATER, LIGHT & PWR DALLMAN	3	NEW	205.	LIMESTONE RESEARCH-COTTRELL	10/80
ST. JOE ZINC G.F. WEATON	1	RETROFIT	60.	CITRATE MORRISON & KNUDSEN/U.S.B.M.	11/79
TENNESSEE VALLEY AUTHORITY SHAWNEE	10A	RETROFIT	10.	LIME/LIMESTONE AIR CORRECTION DIVISION, UOP	4/72
TENNESSEE VALLEY AUTHORITY SHAWNEE	10B	RETROFIT	10.	LIME/LIMESTONE CHEMICO DIVISION, ENVIROTECH	4/72
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK	8	RETROFIT	550.	LIMESTONE TENNESSEE VALLEY AUTHORITY	5/77
TEXAS POWER & LIGHT SANDOW	4	NEW	382.	LIMESTONE COMBUSTION ENGINEERING	12/80
TEXAS UTILITIES MARTIN LAKE	1	NEW	595.	LIMESTONE RESEARCH-COTTRELL	4/77
TEXAS UTILITIES MARTIN LAKE	2	NEW	595.	LIMESTONE RESEARCH-COTTRELL	5/78
TEXAS UTILITIES MARTIN LAKE	3	NEW	595.	LIMESTONE RESEARCH-COTTRELL	2/79
TEXAS UTILITIES MONTICELLO	3	NEW	800.	LIMESTONE CHEMICO DIVISION, ENVIROTECH	5/78
UTAH POWER & LIGHT HUNTER	1	NEW	360.	LIME CHEMICO DIVISION, ENVIROTECH	5/79
UTAH POWER & LIGHT HUNTER	2	NEW	360.	LIME CHEMICO DIVISION, ENVIROTECH	6/80
UTAH POWER & LIGHT HUNTINGTON	1	NEW	366.	LIME CHEMICO DIVISION, ENVIROTECH	5/78
TOTAL			28214.		

SECTION 10
SUMMARY OF FGD SYSTEMS UNDER CONSTRUCTION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ARIZONA PUBLIC SERVICE CHOLLA	4	NEW	126.	LIMESTONE RESEARCH-COTTRELL	2/81
ASSOCIATED ELECTRIC COOP THOMAS HILL	3	NEW	670.	LIMESTONE PULLMAN KELLOGG	1/82
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY	1	NEW	440.	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	4/83
BASIN ELECTRIC POWER COOP LARAMIE RIVER	2	NEW	570.	LIMESTONE RESEARCH-COTTRELL	6/81
BASIN ELECTRIC POWER COOP LARAMIE RIVER	3	NEW	570.	LIME/SPRAY DRYING BABCOCK & WILCOX	10/82
CINCINNATI GAS & ELECTRIC EAST BEND	2	NEW	650.	LIME BABCOCK & WILCOX	2/81
EAST KENTUCKY POWER COOP SPURLOCK	2	NEW	500.	LIME COMBUSTION EQUIP ASSOCIATES	10/81
GRAND HAVEN BRD OF LIGHT & PWR J.B. SIMS	3	NEW	65.	LIME BABCOCK & WILCOX	6/83
HOOSIER ENERGY MEROM	1	NEW	441.	LIMESTONE MITSUBISHI HEAVY INDUSTRIES	5/82
HOOSIER ENERGY MEROM	2	NEW	441.	LIMESTONE MITSUBISHI HEAVY INDUSTRIES	9/81
HOUSTON LIGHTING & POWER W.A. PARISH	8	NEW	492.	LIMESTONE CHEMICO DIVISION, ENVIROTECH	11/82
INDIANAPOLIS POWER & LIGHT PETERSBURG	4	NEW	530.	LIMESTONE RESEARCH-COTTRELL	10/84
LAKELAND UTILITIES MCINTOSH	3	NEW	364.	LIMESTONE BABCOCK & WILCOX	8/81
LOUISVILLE GAS & ELECTRIC MILL CREEK	2	RETROFIT	350.	LIME COMBUSTION ENGINEERING	12/81
LOUISVILLE GAS & ELECTRIC MILL CREEK	4	NEW	495.	LIME AMERICAN AIR FILTER	6/82
MICHIGAN SO CENTRAL PWR AGENCY PROJECT	1	NEW	55.	LIMESTONE BABCOCK & WILCOX	6/82
MONTANA POWER COLSTRIP	3	NEW	700.	LIME/ALKALINE FLYASH COMBUSTION EQUIP ASSOCIATES	0/83
MONTANA POWER COLSTRIP	4	NEW	700.	LIME/ALKALINE FLYASH COMBUSTION EQUIP ASSOCIATES	0/84
MONTANA-DAKOTA UTILITIES COYOTE	1	NEW	440.	SODIUM CARBONATE/SPRAY DRYING WHEELABRATOR-FRYE/R.I.	3/81
NIAGARA MOHAWK POWER COOP CHARLES R. HUNTLEY	66	RETROFIT	100.	AQUEOUS CARBONATE/SPRAY DRYING ROCKWELL INTERNATIONAL	4/82
PHILADELPHIA ELECTRIC CROMBY	1	RETROFIT	150.	MAGNESIUM OXIDE UNITED ENGINEERS	5/83
PHILADELPHIA ELECTRIC EDDYSTONE	1	RETROFIT	240.	MAGNESIUM OXIDE UNITED ENGINEERS	12/82
PHILADELPHIA ELECTRIC EDDYSTONE	2	RETROFIT	334.	MAGNESIUM OXIDE UNITED ENGINEERS	12/82

SECTION 10
SUMMARY OF FGD SYSTEMS UNDER CONSTRUCTION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
PUBLIC SERVICE INDIANA GIBSON	5	NEW	650.	LIMESTONE PULLMAN KELLOGG	0/82
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	4	NEW	534.	WELLMAN LORD DAVY MCKEE	6/82
SAN MIGUEL ELECTRIC COOP SAN MIGUEL	1	NEW	400.	LIMESTONE BABCOCK & WILCOX	8/81
SIKESTON BRD OF MUNICIPAL UTIL SIKESTON	1	NEW	235.	LIMESTONE BABCOCK & WILCOX	6/81
SOUTH CAROLINA PUBLIC SERVICE WINYAH	4	NEW	280.	LIMESTONE AMERICAN AIR FILTER	7/81
TENNESSEE VALLEY AUTHORITY PARADISE	1	RETROFIT	704.	LIMESTONE CHEMICO DIVISION, ENVIROTECH	3/82
TENNESSEE VALLEY AUTHORITY PARADISE	2	RETROFIT	704.	LIMESTONE CHEMICO DIVISION, ENVIROTECH	6/82
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK	7	RETROFIT	575.	LIMESTONE COMBUSTION ENGINEERING	2/81
TEXAS MUNICIPAL POWER AGENCY GIBBONS CREEK	1	NEW	400.	LIMESTONE COMBUSTION ENGINEERING	1/82
UNITED POWER ASSOCIATION STANTON	1A	NEW	50.	LIME/SPRAY DRYING RESEARCH-COTTRELL	6/82
UTAH POWER & LIGHT NAUGHTON	3	RETROFIT	330.	SODIUM CARBONATE AIR CORRECTION DIVISION, UOP	6/81
TOTAL			14285.		

SECTION 11
SUMMARY OF CONTRACT AWARDED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ARIZONA PUBLIC SERVICE FOUR CORNERS	4	RETROFIT	755.	LIME UNITED ENGINEERS	0/82
ARIZONA PUBLIC SERVICE FOUR CORNERS	5	RETROFIT	755.	LIME UNITED ENGINEERS	0/82
BIG RIVERS ELECTRIC D.B. WILSON	1	NEW	440.	LIMESTONE PULLMAN KELLOGG	7/84
BIG RIVERS ELECTRIC D.B. WILSON	2	NEW	440.	LIMESTONE PULLMAN KELLOGG	1/86
COLORADO UTE ELECTRIC ASSN CRAIG	3	NEW	447.	LIME/SPRAY DRYING BABCOCK & WILCOX	0/82
DESERET GEN & TRANS COOP MOON LAKE	1	NEW	410.	LIMESTONE COMBUSTION ENGINEERING	9/84
HOUSTON LIGHTING & POWER LIMESTONE	1	NEW	750.	LIMESTONE COMBUSTION ENGINEERING	12/84
HOUSTON LIGHTING & POWER LIMESTONE	2	NEW	750.	LIMESTONE COMBUSTION ENGINEERING	12/85
MARQUETTE BOARD OF LIGHT & PWR SHIRAS	3	NEW	31.	LIME BUELL DIVISION, ENVIROTECH	10/82
MUSCATINE POWER & WATER MUSCATINE	9	NEW	166.	LIMESTONE RESEARCH-COTTRELL	9/82
NORTHERN INDIANA PUB SERVICE SCHAHFER	17	NEW	421.	DUAL ALKALI FMC	6/83
NORTHERN INDIANA PUB SERVICE SCHAHFER	18	NEW	421.	DUAL ALKALI FMC	6/85
PLAINS ELECTRIC G & T COOP PLAINS ESCALANTE	1	NEW	233.	LIMESTONE COMBUSTION ENGINEERING	12/83
PLATTE RIVER POWER AUTHORITY RAWHIDE	1	NEW	279.	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	12/83
SEMINOLE ELECTRIC SEMINOLE	1	NEW	620.	LIMESTONE PEABODY PROCESS SYSTEMS	3/83
SEMINOLE ELECTRIC SEMINOLE	2	NEW	620.	LIMESTONE PEABODY PROCESS SYSTEMS	3/85
SOUTH CAROLINA PUBLIC SERVICE CROSS	1	NEW	500.	LIMESTONE PEABODY PROCESS SYSTEMS	3/85
SOUTH CAROLINA PUBLIC SERVICE CROSS	2	NEW	500.	LIMESTONE PEABODY PROCESS SYSTEMS	1/84
SOUTHWESTERN ELECTRIC POWER DOLET HILLS	1	NEW	720.	LIMESTONE AIR CORRECTION DIVISION, UOP	3/86
SOUTHWESTERN ELECTRIC POWER HENRY W. PIRKEY	1	NEW	720.	LIMESTONE AIR CORRECTION DIVISION, UOP	12/84
SUNFLOWER ELECTRIC COOP HOLCOMB	1	NEW	347.	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	9/83
TAMPA ELECTRIC BIG BEND	4	NEW	475.	LIME/LIMESTONE RESEARCH-COTTRELL	3/85
TEXAS POWER & LIGHT TWIN OAKS	1	NEW	750.	LIMESTONE CHEMICO DIVISION, ENVIROTECH	8/84

SECTION 11
SUMMARY OF CONTRACT AWARDED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
TEXAS POWER & LIGHT TWIN OAKS	2	NEW	750.	LIMESTONE CHEMICO DIVISION, ENVIROTECH	8/85
TEXAS UTILITIES MARTIN LAKE	4	NEW	750.	LIMESTONE RESEARCH-COTTRELL	0/85
TUCSON ELECTRIC POWER SPRINGERVILLE	1	NEW	370.	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	1/85
TUCSON ELECTRIC POWER SPRINGERVILLE	2	NEW	370.	LIME/SPRAY DRYING JOY MFG/NIRO ATOMIZER	3/87
UTAH POWER & LIGHT HUNTER	3	NEW	400.	LIMESTONE CHEMICO DIVISION, ENVIROTECH	6/83
UTAH POWER & LIGHT HUNTER	4	NEW	400.	LIMESTONE CHEMICO DIVISION, ENVIROTECH	6/85
WEST PENN POWER MITCHELL	33	RETROFIT	300.	LIME CHEMICO DIVISION, ENVIROTECH	8/82
TOTAL			14890.		

SECTION 12
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
LETTER OF INTENT SIGNED					
EAST KENTUCKY POWER COOP J.K. SMITH	1	NEW	650.	PROCESS NOT SELECTED BABCOCK & WILCOX	1/85
EAST KENTUCKY POWER COOP J.K. SMITH	2	NEW	650.	PROCESS NOT SELECTED BABCOCK & WILCOX	1/87
MIDDLE SOUTH UTILITIES ARKANSAS LIGNITE	5	NEW	650.	PROCESS NOT SELECTED COMBUSTION ENGINEERING	0/90
MIDDLE SOUTH UTILITIES ARKANSAS LIGNITE	6	NEW	650.	PROCESS NOT SELECTED COMBUSTION ENGINEERING	0/92
MIDDLE SOUTH UTILITIES UNASSIGNED	1	NEW	650.	PROCESS NOT SELECTED COMBUSTION ENGINEERING	0/89
MIDDLE SOUTH UTILITIES UNASSIGNED	2	NEW	650.	PROCESS NOT SELECTED COMBUSTION ENGINEERING	0/93
MIDDLE SOUTH UTILITIES WILTON	1	NEW	650.	PROCESS NOT SELECTED COMBUSTION ENGINEERING	0/88
MIDDLE SOUTH UTILITIES WILTON	2	NEW	650.	PROCESS NOT SELECTED COMBUSTION ENGINEERING	0/91
NEVADA POWER REID GARDNER	4	NEW	650.	SODIUM CARBONATE COMBUSTION EQUIP ASSOCIATES	4/83
NEW YORK STATE ELEC & GAS SOMERSET	1	NEW	650.	LIMESTONE PEABODY PROCESS SYSTEMS	6/84
TOTAL			650.		
REQUESTING/EVALUATING BIDS					
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY	2	NEW	440.	LIME/SPRAY DRYING VENDOR NOT SELECTED	10/85
CAJUN ELECTRIC POWER COOP OXBOW	1	NEW	440.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/85
CENTRAL ILLINOIS LIGHT DUCK CREEK	2	NEW	440.	LIMESTONE VENDOR NOT SELECTED	1/86
DESERET GEN & TRANS COOP MOON LAKE	2	NEW	440.	LIMESTONE VENDOR NOT SELECTED	0/88
GENERAL PUBLIC UTILITIES COAL	1	NEW	440.	PROCESS NOT SELECTED VENDOR NOT SELECTED	5/91
GENERAL PUBLIC UTILITIES SEWARD	7	NEW	440.	PROCESS NOT SELECTED VENDOR NOT SELECTED	5/89
IOWA ELECTRIC LIGHT & PWR GUTHRIE CO.	1	NEW	440.	LIMESTONE VENDOR NOT SELECTED	11/84
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY	1	NEW	440.	PROCESS NOT SELECTED VENDOR NOT SELECTED	7/85
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY	2	NEW	440.	PROCESS NOT SELECTED VENDOR NOT SELECTED	7/88
NEVADA POWER WARNER VALLEY	1	NEW	440.	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/85

SECTION 12
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
NEVADA POWER WARNER VALLEY	2	NEW	440.	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/86
PACIFIC POWER & LIGHT JIM BRIDGER	1	RETROFIT	440.	SODIUM CARBONATE VENDOR NOT SELECTED	0/88
PACIFIC POWER & LIGHT JIM BRIDGER	2	RETROFIT	440.	SODIUM CARBONATE VENDOR NOT SELECTED	0/84
PACIFIC POWER & LIGHT JIM BRIDGER	3	RETROFIT	440.	SODIUM CARBONATE VENDOR NOT SELECTED	0/86
TEXAS UTILITIES FOREST GROVE	1	NEW	440.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/87
WEST TEXAS UTILITIES OKLAUNION	1	NEW	440.	PROCESS NOT SELECTED VENDOR NOT SELECTED	12/86
TOTAL			440.		

CONSIDERING FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ATLANTIC CITY ELECTRIC CUMBERLAND	1	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	1/88
CAJUN ELECTRIC POWER COOP CHICOT	1	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/86
CAJUN ELECTRIC POWER COOP CHICOT	2	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/88
CAJUN ELECTRIC POWER COOP CHICOT	3	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/92
CAJUN ELECTRIC POWER COOP CHICOT	4	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/94
CAJUN ELECTRIC POWER COOP OXBOW	2	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/85
CENTRAL MAINE POWER SEARS ISLAND	1	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	1/89
CENTRAL POWER & LIGHT COLETO CREEK	2	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	9/86
CINCINNATI GAS & ELECTRIC EAST BEND	1	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	10/87
COLUMBUS & SOUTHERN OHIO ELEC POSTON	5	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	8/86
COLUMBUS & SOUTHERN OHIO ELEC POSTON	6	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/89
DELMARVA POWER & LIGHT VIENNA	9	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/87
FLORIDA POWER & LIGHT MARTIN	3	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/87
FLORIDA POWER & LIGHT MARTIN	4	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/89
GENERAL PUBLIC UTILITIES COAL	2	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	5/93

SECTION 12
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
GENERAL PUBLIC UTILITIES COAL	3	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	5/95
GENERAL PUBLIC UTILITIES COAL	4	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	5/96
INDIANAPOLIS POWER & LIGHT PATRIOT	1	NEW	330.	LIMESTONE VENDOR NOT SELECTED	0/87
INDIANAPOLIS POWER & LIGHT PATRIOT	2	NEW	330.	LIMESTONE VENDOR NOT SELECTED	0/ 0
INDIANAPOLIS POWER & LIGHT PATRIOT	3	NEW	330.	LIMESTONE VENDOR NOT SELECTED	0/ 0
JACKSONVILLE ELEC AUTHORITY ST.JOHNS RIVER PWR PARK1		NEW	330.	LIMESTONE VENDOR NOT SELECTED	12/85
JACKSONVILLE ELEC AUTHORITY ST.JOHNS RIVER PWR PARK2		NEW	330.	LIMESTONE VENDOR NOT SELECTED	6/87
KENTUCKY UTILITIES HANCOCK	1	NEW	330.	LIMESTONE VENDOR NOT SELECTED	0/88
KENTUCKY UTILITIES HANCOCK	2	NEW	330.	LIMESTONE VENDOR NOT SELECTED	0/94
LANSING BOARD OF WATER & LIGHT ERICKSON	2	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	1/87
LOS ANGELES DEPT OF WTR & PWR INTERMOUNTAIN	1	NEW	330.	LIME VENDOR NOT SELECTED	0/86
LOS ANGELES DEPT OF WTR & PWR INTERMOUNTAIN	2	NEW	330.	LIME VENDOR NOT SELECTED	0/87
LOS ANGELES DEPT OF WTR & PWR INTERMOUNTAIN	3	NEW	330.	LIME VENDOR NOT SELECTED	0/88
LOS ANGELES DEPT OF WTR & PWR INTERMOUNTAIN	4	NEW	330.	LIME VENDOR NOT SELECTED	0/89
LOWER COLORADO RIVER AUTH FAYETTE POWER PROJECT	3	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/88
NEBRASKA PUBLIC POWER DISTRICT FOSSIL III	1	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	3/87
NEVADA POWER HARRY ALLEN	1	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/86
NEVADA POWER HARRY ALLEN	2	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/87
NEVADA POWER HARRY ALLEN	3	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/88
NEVADA POWER HARRY ALLEN	4	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/89
NORTHERN STATES POWER METRO COAL	1	NEW	330.	LIME VENDOR NOT SELECTED	0/90
NORTHERN STATES POWER SHERBURNE	3	NEW	330.	LIME VENDOR NOT SELECTED	0/85
NORTHERN STATES POWER WISCONSIN COAL	1	NEW	330.	LIME VENDOR NOT SELECTED	0/91

SECTION 12
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
PACIFIC GAS & ELECTRIC MONTEZUMA	1	NEW	330.	LIMESTONE VENDOR NOT SELECTED	6/94
PACIFIC GAS & ELECTRIC MONTEZUMA	2	NEW	330.	LIMESTONE VENDOR NOT SELECTED	6/90
PWR AUTHORITY OF STATE OF NY FOSSIL		NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	4/87
SALT RIVER PROJECT CORONADO	3	NEW	330.	LIMESTONE VENDOR NOT SELECTED	0/89
SOUTHERN ILLINOIS POWER COOP MARION	5	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/88
SOUTHWESTERN ELECTRIC POWER DOLET HILLS	2	NEW	330.	LIMESTONE VENDOR NOT SELECTED	3/88
SOYLAND POWER COOP SOYLAND	1	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/87
TEXAS UTILITIES MILL CREEK	1	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/85
TEXAS UTILITIES MILL CREEK	2	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/86
WASHINGTON WATER POWER CRESTON COAL	1	NEW	330.	LIMESTONE VENDOR NOT SELECTED	0/87
WEST TEXAS UTILITIES OKLAUNION	2	NEW	330.	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/90
TOTAL			330.		

SECTION 13

TOTAL FGD UNITS AND CAPACITY (MW) INSTALLED BY YEAR

	NEW ON LINE		TERMINATED		TOTAL ON LINE	
YEAR	NO.	MW	NO.	MW	NO.	MW
1968	1	140.	0	0.	1	140.
1969	0	0.	1	140.	0	0.
1972	9	674.	0	0.	9	674.
1973	5	1514.	1	10.	13	2178.
1974	3	416.	3	340.	13	2254.
1975	7	2182.	5	628.	15	3808.
1976	7	2699.	4	1014.	18	5493.
1977	11	4589.	4	2049.	25	8033.
1978	14	4973.	0	0.	39	13006.
1979	20	6300.	2	143.	57	19163.
1980	20	6711.	0	0.	77	25874.
1981	13	5261.	0	0.	90	31135.
1982	22	9510.	0	0.	112	40645.
1983	11	3905.	0	0.	123	44550.
1984	12	6971.	0	0.	135	51521.
1985	18	10276.	0	0.	153	61797.
1986	12	6880.	0	0.	165	68677.
1987	15	8920.	0	0.	180	77597.
1988	12	6720.	0	0.	192	84317.
1989	8	4955.	0	0.	200	89272.
1990	4	2610.	0	0.	204	91882.
1991	3	2185.	0	0.	207	94067.
1992	2	1430.	0	0.	209	95497.
1993	2	1515.	0	0.	211	97012.
1994	3	1990.	0	0.	214	99002.
1995	1	625.	0	0.	215	99627.
1996	1	625.	0	0.	216	******
UNDEFINED	7	1806.				

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                   COMMONWEALTH EDISON
PLANT NAME                                     WILL COUNTY
UNIT NUMBER                                    1
CITY                                           ROMEOVILLE
STATE                                          ILLINOIS
REGULATORY CLASSIFICATION                      ******
PARTICULATE EMISSION LIMITATION - NG/J           86.         (  .200 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  774.         ( 1.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                 ******        (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW             1147
GROSS UNIT GENERATING CAPACITY - MW              167
NET UNIT GENERATING CAPACITY W/FGD - MW          137
NET UNIT GENERATING CAPACITY WO/FGD - MW         144
EQUIVALENT SCRUBBED CAPACITY - MW                167

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                           BABCOCK & WILCOX
     BOILER TYPE                               CYCLONE
     BOILER SERVICE LOAD                       CYCLING
     DESIGN BOILER FLUE GAS FLOW - CU.M/S        363.36      ( 770000 ACFM)
     BOILER FLUE GAS TEMPERATURE - C             179.4       ( 355 F)
     STACK HEIGHT - M                            107.        ( 350 FT)
     STACK SHELL                               ******
     STACK TOP DIAMETER - M                        3.8       ( 12.4 FT)

 ** FUEL DATA
     FUEL TYPE                                 COAL
     FUEL GRADE                                ******
     AVERAGE HEAT CONTENT - J/G                22260.        (  9570 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                              9,100 - 10,500
     AVERAGE ASH CONTENT - %                       7.40
     RANGE ASH CONTENT - %                     3 - 16
     AVERAGE MOISTURE CONTENT - %              ********
     RANGE MOISTURE CONTENT - %                ******
     AVERAGE SULFUR CONTENT - %                    1.50
     RANGE SULFUR CONTENT - %                  0.3 - 4.5
     AVERAGE CHLORIDE CONTENT - %              ********
     RANGE CHLORIDE CONTENT - %                ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
     NUMBER                                     0
     TYPE                                      NONE

 ** FABRIC FILTER
     NUMBER                                     0
     TYPE                                      NONE

 ** ESP
     NUMBER                                     1
     TYPE                                      COLD SIDE
     SUPPLIER                                  WESTERN PREC. DIVISION, JOY
     INLET FLUE GAS TEMPERATURE - C              179.4       (  355 F)
     PARTICLE REMOVAL EFFICENCY - %               90.0

 ** PARTICLE SCRUBBER
     NUMBER                                     2
     GENERIC TYPE                              NONE
     SPECIFIC TYPE                             VARIABLE-THROAT/SIDE-MOVABLE BLADES
     SUPPLIER                                  BABCOCK & WILCOX
     DIMENSIONS - FT                           8 X 26 X 16 (THROAT 21 X 1.8)
     LIQUID RECIRCULATION RATE - LITER/S         365.4       ( 5800 GPM)
     L/G RATIO - LITER/CU.M                        2.4       (18.0 GAL/1000ACF)
     PRESSURE DROP - KPA                           2.2       ( 9.0 IN-H2O)
     SUPERFICIAL GAS VELOCITY - M/S               36.6       (  120.0 FT/S)
     INLET GAS FLOW RATE - CU.M/S                181.7       ( 385000 ACFM)
     INLET GAS TEMPERATURE - C                   179.4       (  355 F)
     PARTICLE REMOVAL EFFICIENCY - %              98.0
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COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/72	SYSTEM							696			

** PROBLEMS/SOLUTIONS/COMMENTS

IN FEBRUARY 1972 THE BABCOCK & WILCOX WET LIMESTONE FGD SYSTEM AT WILL COUNTY COMMENCED OPERATION. THE LONGEST PERIOD OF CONTINUOUS OPERATION WAS 23 DAYS WITH ONE OF THE TWO MODULES. THE SO2 REMOVAL EFFICIENCY WAS ABOUT 85% AND THE PARTICULATE MATTER REMOVAL EFFICIENCY WAS ABOUT 98%. THE SYSTEM WAS PLAGUED WITH MANY MECHANICAL PROBLEMS. THE MAIN PROBLEMS ASSOCIATED WITH THE FGD SYSTEM WERE PLUGGING OF THE MIST ELIMINATORS, CORROSION OF THE REHEATER TUBES AND SLUDGE DISPOSAL. TO SOLVE THE MIST ELIMINATOR AND REHEATER PROBLEMS, A CONSTANT UNDERSPRAY AND INTERMITTENT OVERSPRAY WERE USED TO WASH ALL THE MIST ELIMINATOR COMPARTMENTS. THE REHEATER UNIT WAS ALSO RETUBED.
DURING THE FIRST TWO MONTHS OF 1975 MODULE A WAS OPERATIONAL WHEN NEEDED WHILE MODULE B WAS UNDERGOING MODIFICATIONS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/75	A	94.0	99.2		81.2						
	B	.0	.0		.0						
	SYSTEM							744	609		

** PROBLEMS/SOLUTIONS/COMMENTS

A VENTURI HOSE LEAK FORCED MODULE A OUT ONCE.

MODULE B WAS OUT OF SERVICE TWICE FOR NO DEMAND AND ONCE AS A RESULT OF AN ACCIDENTAL 50 MINUTE TRIP.

COAL BURNED THIS MONTH AVERAGED LESS THAN ONE PERCENT SULFUR.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/75	A	37.0	39.5		35.0						
	B	.0	.0		.0						
	SYSTEM							720	638		

** PROBLEMS/SOLUTIONS/COMMENTS

CHICAGO FLY ASH IS TREATING MATERIAL FROM THE SCRUBBER WITH LIME AND FLY ASH AND DUMPING IT INTO THE HOLDING BASIN.

A BOILER OUTAGE FORCED MODULE A OUT OF SERVICE ONCE THIS MONTH (MODULE B WAS ALREADY OUT OF SERVICE).

COAL BURNED THIS MONTH WAS RECLAIM COAL AND VARIED IN SULFUR CONTENT.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/75	A	84.5	84.5		84.5						
	B	37.1	37.1		37.1						
	SYSTEM							744	744		

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS IN SERVICE ON MAY 20 FOR THE FIRST TIME SINCE APRIL 13, 1973.

RECIRCULATION TANK MIXERS.

MODULE A (WHICH WAS THE ONLY ONE OPERATING) WAS FORCED OUT TWICE IN APRIL TO AVOID POND OVERBOARDING INTO THE DES PLAINES RIVER. THE SECOND OUTAGE LASTED UNTIL MAY 5. DURING THE PAST SEVERAL MONTHS OF GENERALLY CONTINUOUS OPERATION OF MODULE A. IT HAS BECOME APPARENT THAT THE PRESENT LIQUID CIRCULATING SYSTEM CANNOT BE OPERATED IN A CONTINUOUSLY CLOSED CYCLE. THE WATER IMBALANCE POSES A HIGH RISK OF OVERBOARDING FROM THE SLUDGE POND DURING LONG PERIODS OF SUSTAINED OPERATON. THE FOLLOWING REVISIONS HAVE BEEN MADE TO REDUCE THE WATER IMBALANCE:

1. THE PUMP GLAND WATER FLOWS HAVE BEEN CUT FROM 10 GPM TO 5 GPM.

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

2. THE SCRUBBER HOUSE SERVICE WATER FILTER BACKWASH HAS BEEN ROUTED OUT OF THE SYSTEM.
3. THE CONTINUOUS UNDERSPRAY HAS BEEN CHANGED TO AN INTERMITTENT SPRAY 5 MINUTES ON, 5 MINUTES OFF.

THE THICKENER HAS BEEN DOWN SINCE APRIL 21 DUE TO A BROKEN GEAR AND A STUCK SWEEP ARM. THE THICKENER HAS BEEN BYPASSED AND THE SLUDGE IS GOING TO THE POND.

DURING MAY, MODULE A WAS OUT FOR 45 MINUTES DUE TO A DAMPER TRIP.

MODULE A WAS OUT ONCE FOR SPRAY NOZZLE CLEANING.

MODULE B WAS OUT TWICE AFTER START UP, ONCE FOR A VENTURI PUMP TRIP AND ONCE FOR A RECIRCULATION TANK LEVEL TRIP.

CHICAGO FLY ASH IS TREATING THE MATERIAL FROM THE SCRUBBER WITH LIME AND FLY ASH AND DUMPING IT INTO THE HOLDING BASIN. A MIXER HAS BEEN INSTALLED AT THE THICKENER, WHICH ENABLES THEM TO SUBSTITUTE SEALED DUMP TRUCKS FOR THE CEMENT TRUCKS WHICH WERE USED IN THE PAST FOR MIXING AND TRANSPORTING THE WASTE MATERIAL TO THE HOLDING BASIN.

COAL BURNED THIS MONTH VARIED GREATLY IN SULFUR CONTENT, RANGING FROM LOW SULFUR WESTERN COAL TO HIGH SULFUR ILLINOIS COAL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/75	A	64.1	60.6		54.1						
	B	85.5	84.6		75.4						
	SYSTEM							720	642		

** PROBLEMS/SOLUTIONS/COMMENTS

A REHEATER PLUGGAGE INSPECTION FORCED ONE MODULE A OUTAGE.

A LOW LEVEL TRIP CAUSED A 35 MINUTE OUTAGE, AND NO DEMAND ACCOUNTED FOR TWO MORE MODULE A OUTAGES.

MODULE B WAS OUT FOR 95 HOURS TO CLEAN THE BOOSTER FAN AND DEMISTER.

HIGH BOOSTER FAN VIBRATIONS CAUSED MODULE B TO SHUT DOWN ON JUNE 30.

DURING THIS MONTH HIGH SULFUR COAL WAS BURNED IN A TWO WEEK TEST, AND LOW SULFUR COAL WAS BURNED THE REST OF THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/75	A	.0	.0		.0						
	B	79.2	79.4		73.5						
	SYSTEM							744	689		

** PROBLEMS/SOLUTIONS/COMMENTS

CHICAGO FLY ASH IS TREATING THE SCRUBBER WASTE MATERIAL WITH LIME AND FLY ASH AND DUMPING IT INTO THE ON SITE HOLDING BASIN. THE MATERIAL FROM THE HOLDING BASIN IS BEING TRUCKED TO AN OFF SITE DUMP.

MODULE B WAS OUT ONCE (30 MINUTES) TO REPAIR A MINOR STEAM HEADER LEAK.

MODULE B WAS OUT ONCE DUE TO NO DEMAND.

LOW SULFUR COAL WAS BURNED MOST OF THIS MONT, WITH HIGH SULFUR COAL BEING BURNED DURING THE LAST WEEK OF THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/75	A	.0	.0		.0						
	B	93.5	100.0		76.4						
	SYSTEM							744	565		

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

IN JUNE, MODULE A ENCOUNTERED PLUGGAGE IN THE DEMISTER, WHICH REQUIRED ITS REPLACEMENT. THE WORK WAS COMPLETED IN AUGUST.

MODULE A WENT OUT OF SERVICE ON JUNE 20 AND REMAINED OUT THROUGH AUGUST DUE TO MASSIVE REHEATER LEAKS. THERE IS PRESENTLY A HOLD ON THE NEW REHEATER ORDER BECAUSE OF MATERIAL FAILURES EXPERIENCED IN MODULE B'S CARBON STEEL REHEATER.

MODULE B SUFFERED TWO OUTAGES IN JULY AND ONE IN AUGUST BECAUSE OF REHEATER TUBE LEAKS. THE FAILURES WERE DUE TO VIBRATION FATIGUE. THE REHEATER, WHICH WAS INSTALLED IN MAY, HAS LOST SIX OF ITS TWELVE TUBE BUNDLES SO FAR. THE LENGTH OF TIME THAT THE TUBES HAVE LASTED WOULD SEEM TO INDICATE THAT THERE IS A DIESIGN RELATED MATERIAL DEFICIENCY. THREE OF THE TUBE BUNDLES WERE REPLACED WITH MARGINAL BUNDLES LEFT OVER FROM MODULE A.

A SMALL STEAM HEADER LEAK CAUSED ONE MODULE B OUTAGE.

MODULE B WAS OUT FOUR TIMES FOR NO DEMAND AND ONCE FOR A LOW FLOW TRIP.

HIGH SULFUR COAL WAS BURNED ALL MONTH, CAUSING AN INCREASE IN SLUDGE PRODUCTION WHICH HAS FORCED A MINIMUM SIX DAY A WEEK, TEN HOUR A DAY SLUDGE DISPOSAL OPERATION. THE SLUDGE IS BEING TREATED WITH LIME AND FLY ASH AND BEING DUMPED INTO THE ON SITE HOLDING POND. STABILIZED MATERIAL IS BEING TRUCKED FROM THE POND TO AN OFF SITE DISPOSAL AREA.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/75	A										
	B										
	SYSTEM							720			
10/75	A	.0	.0		.0						
	B	32.3	100.0		26.6						
	SYSTEM							744	194		

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OFF THE ENTIRE 11 DAYS THE BOILER OPERATED THIS MONTH, WAITING FOR ITS NEW REHEATER, WHICH HAS NOW BEEN RELEASED FOR MANUFACTURING BY SMED.

MODULE B HAD TWO OUTAGES, ONE FOR NO DEMAND AND ONE MINOR 15 MINUTE TRIP.

HIGH SULFUR COAL WAS BURNED THIS MONTH WHEN THE SCRUBBER WAS IN SERVICE.

THE SLUDGE IS BEING TREATED WITH LIME AND FLY ASH AND HAULED TO AN OFF SITE DISPOSAL AREA.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/75	A	.0			.0						
	B	.0			.0						
	SYSTEM							720	0		
12/75	A	.0			.0						
	B	.0			.0						
	SYSTEM							744	0		
1/76	A	.0			.0						
	B	.0			.0						
	SYSTEM							744	0		
2/76	A	.0			.0						
	B	.0			.0						
	SYSTEM							696	0		

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/76	A	30.1	45.2		18.8						
	B	8.8	20.4		8.5						
	SYSTEM							744	309		

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS DOWN FROM OCTOBER 11 THROUGH MARCH 19 FOR ITS BOILER TURBINE AND SCRUBBER OVERHAUL. THE MAJOR ITEMS TO BE ACCOMPLISHED DURING THE OUTAGE WERE:

1. SIMPLIFICATION OF THE MILLING SYSTEM CONTROL.
2. PULLING AND CLEANING OF THE MODULE B REHEATER AND RETURNING IT REPLACED WITH MARGINAL BUNDLES LEFT OVER FROM MODULE A.
3. CLEANING OF THE POND PUMP BAY.
4. REMOVAL OF THE VENTURI AND ABSORBER PUMP CHECK VALVES (ONE OF THEM FAILED LAST SPRING AND DESTROYED A PUMP LINER AND IMPELLER).
5. CLEANING AND REPAIR OF THE VENTURI NOZZLES AND SUPPORTS.
6. REPAIR OF CORRODED REHEATER SUPPORTS.
7. RESETTING AND ADJUSTMENT OF ALL DAMPERS.
8. REVISION OF SCRUBBER CONTROLS BY REMOVING THE CONTROLS NO LONGER USED OR NEEDED.
9. INSPECTION AND CLEANING OF THE ENTIRE SCRUBBER AND RELATED EQUIPMENT.

MODULE A WAS PUT INTO THE GAS PATH ON MARCH 22 AND REMAINED AVAILABLE FOR SERVICE THE REST OF THE MONTH.

MODULE B HAD TO REMAIN OUT OF SERVICE UNTIL MARCH 29 WHILE ITS REPAIRED REHEATER WAS INSTALLED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/76	A	23.0	20.0		19.2						
	B		49.3		47.3						
	SYSTEM							720	691		

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 RETURNED TO SERVICE APRIL 2 AFTER A SHORT TURBINE CONTROL OUTAGE. BOTH MODULES CAME ON LINE JUST BEFORE THE BOILER.

A FIVE DAY OUTAGE OF MODULE B WAS DUE TO REHEATER TUBE BUNDLE LEAKS.

SEVERAL MODULE B OUTAGES WERE DUE TO PLUGGED ABSORBER TANK SCREENS CAUSED BY MILL AND CLASSIFIER FAILURES WHICH ALLOWED ROCK TO GET INTO THE SYSTEM. MODULE B WAS THOROUGHLY CLEANED.

ONLY ONE ABSORBER PUMP IS BEING USED IN MODULE B, SINCE THE 1B2 PUMP LINER FAILED AS A RESULT OF A BROKEN DISCHARGE VALVE. A REPLACEMENT LINER IS BEING INSTALLED.

A SCRUBBER TESTING AND EVALUATING PROGRAM WAS STARTED THIS MONTH. MUCH OF THE LATTER TWO WEEKS OF THE MONTH WERE SPENT TRAINING THE TESTING PERSONNEL. THE PROGRAM WILL PROVIDE CHEMISTRY DATA AND OPERATING CHARACTERISTICS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/76	A	.0	.0		.0						
	SYSTEM							744	665		

** PROBLEMS/SOLUTIONS/COMMENTS

A VENTRUI HOSE LEAK FORCED MODULE B OFF ONCE THIS MONTH.

MODULE B WAS TAKEN OUT OF SERVICE ONCE BECAUSE OF A PLUGGED ABSORBER TANK SCREEN.

MODULE B WAS OFF ONCE DUE TO A FOULED I.D. FAN.

PERFORMANCE DATA

MODULE B WAS OUT OF THE GAS PATH ONCE DUE TO NO DEMAND.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/76	A	52.0	44.2		37.6						
	B	86.2	84.5		71.9						
	SYSTEM							720	612		

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A SUFFERED VENTURI PUMP LINER FAILURES ON APRIL 78 WHEN AN INLET 16 INCH BUTTERFLY ISOLATION VALVE BROKE APART AND FELL INTO THE VENTURI PUMP. BOTH THE A AND BACKUP AB VENTURI PUMP LINERS WERE DESTROYED. MODULE A REMAINED OUT SERVICE UNITL JUNE 9, WHEN THE LINERS WERE REPLACED.

MODULE A WAS OFF ONCE FOR SHEARED BYPASS DAMPER PINS.

I.D. BOOSTER FAN FOULING FORCED MODULE A OFF ONCE THIS MONTH FOR ABOUT 164 HOURS.

BOTH MODULES WERE OFF TWICE DUE TO NO DEMAND. DURING THESE OUTAGES, THE DEMISTERS WERE WASHED AND ABSORBER TRAY SCALE, IF ANY, WAS KNOCKED OFF.

MODULE B WAS OUT OF THE GAS PATH FOR SEVERAL SHORT VENTURI LOW FLOW TRIP OUTAGES DUE TO A PLUGGED, SCALED VENTURI TANK SCREEN. AT THE END OF THE MONTH, THE MODULE WAS TAKEN OUT TO CLEAN THE SCREEN.

THE MODULE B I.D. BOOSTER FAN REQUIRED CLEANING DURING THE MONTH.

THE REHEATER TUBES ARE SCALING, WHICH RESULTS IN A LOWER HEAT TRANSFER RATE RATE, AND THEREFORE INCREASES I.D. BOOSTER FAN FOULING. THE ONLY WAY TO CLEAN THE REHEATERS EFFECTIVELY IS TO REMOVE THEM, WHICH DEMANDS A SUBSTANTIAL OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/76	A	19.9	.0		.0						
	B	86.2	90.0		72.3						
	SYSTEM							744	598		

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OFF THE FIRST PART OF THE MONTH DURING REPAIRS TO THE ABSORBER

THE LATTER PART OF THE MONTH THE MODULE WAS READY FOR SERVICE BUT WAS NOT OPERATED BECAUSE OF THICKENER-POND SLUDGE OVERLOADING.

MODULE B WAS FORCED OFF ONCE TO BALANCE THE I.D. BOOSTER FAN, AND ONCE TO WASH THE FAN.

MODULE B WAS OUT OF THE GAS PATH TWICE DUE TO NO DEMAND.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/76	A	98.2	57.6		38.3						
	B	65.4	61.4		40.9						
	SYSTEM							744	495		

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OUT OF THE GAS PATH THE FIRST HALF OF THE MONTH T AVOID THICKENER-POND OVERLOADING.

DURING THE LATTER HALF OF THE MONTH, MODULE A WAS USED WITH THREE MINOR FORCED OUTAGES AND ONE FOUR DAY NO DEMAND OUTAGE.

MODULE B WAS OUT OF THE GAS PATH THREE TIMES DUE TO NO DEMAND.

LOSS OF CHEMICAL CONTROL CAUSED TWO MODULE A OUTAGES.

PERFORMANCE DATA

MODULE B WAS OFF FOR NINE DAYS DUE TO FOULING.

SPENT SLURRY VALVE REPAIRS FORCED A MODULE B OUTAGE.

ON AUGUST 12 THE OPERATING PH CONTROL SET POINT WAS REDUCED FROM 5.4 TO 5.1. IT IS BELIEVED THAT THIS LOWER PH IS THE CAUSE OF THE FOULING OUTAGE OF MODULE B ON AUGUST 21. MODULE A WAS ALSO OPERATED FOR THREE DAYS, AND IT, TOO, EXPERIENCED INCREASED SACLE FOULING. THE PH SET POINT WAS THEN INCREASED BACK TO 5.4.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/76	A	42.3	28.7		22.6						
	B	79.4			59.9						
	SYSTEM							720	566		

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WENT OFF ONCE DUE TO A LOW FLOW TRIP.

MODULE A WAS TAKEN OFF ONCE FOR CLEANING OF THE RECIRCULATION TANK AND PUMPS, AND INSPECTION OF PUMP ISOLATION VALVES.

A LINER LEAK IN 1A2 ABOSORBER PUMP ALSO FORCED MODULE A OFF.

MODULE A WAS OUT OF TH GAS PATH TWICE DUE TO NO DEMAND.

MODULE A WAS TAKEN OFF ONCE TO AVOID THICKENER-POND OVERLOADING.

SPENT SLURRY VALVE TROUBLE CAUSED TWO MODULE B OUTAGES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/76	A	27.9	28.9		37.9						
	B	76.4	56.2		54.8						
	SYSTEM							744	726		

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH SULFUR ILLINOIS COAL WAS BURNED IN THE BOILER FROM MARCH THROUGH OCTOBER.

THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLY ASH AND HAULED TO AN OFF SITE DISPOSAL AREA.

MODULE A OPERATED ON ONE ABSORBER PUMP, ALLOWING TESTING ON A LOWER ABSORBER FAN.

MODULE A WAS OUT OF THE GAS PATH ONCE FOR AN I.D. BOBOOSTER FAN TRIP.

WORK ON RECIRCULATION TANK LEVEL CONTROLS CAUSED A MODULE A OUTAGE.

MODULE B WAS FORCED OFF ONCE TO REPAIR A REHEATER HEADER LEAK.

ONE MODULE B OUTAGE WAS FOR VENTURI NOZZLE CLEANING.

MODULE B WENT OFF FOR A VENTURI LOW FLOW TRIP.

MODULE B REMAINED OUT OF SERVICE WHILE MODULE A WAS BEING TESTED TO AVOID THICKENER-POND OVERLOADING.

A VACUUM FILTER WAS TIED IN AT THE THICKENER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/76	A	20.1	25.6		20.1						
	B	72.2	69.6		4.7						
	SYSTEM							720	566		

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A OPERATED ON ONE ABSORBER PUMP DURING MODULE B OUTAGE.

MODULE B WAS FORCED OUT OF THE GAS PATH ONCE FOR A MILLING SYSTEM FAILURE.

MODULE B ENCOUNTERED A VENTURI HEADER LEAK.

THE VENTURI NOZZLES REQUIRED CLEANING DURING THE MONTH.

REPLACEMENT OF THE SPENT SLURRY VALVE NECESSITATED A MODULE OUTAGE.

MODULE B WAS OFF ONCE DUE TO A CHEMICAL SYSTEM UPSET.

MODULE B WAS OUT OF THE GAS PATH TWICE DUE TO NO DEMAND (MODULE A WAS NOT IN SERVICE AT THE TIME OF THE OUTAGE).

12/76	A	44.9	48.3		44.9						
	B	53.4	51.7		48.0						
	SYSTEM							744	692		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE LAST WEEK OF NOVEMBER, THE 1A2 ABSORBER PUMP WAS TAKEN OUT OF SERVICE FOR OVERHAUL. THE REPAIRS WERE COMPLETED ON DECEMBER 6, WHEN THE MODULE ASSUMED A ONE ABSORBER PUMP STANDBY CAPABILITY UNTIL THE 1A1 ABSORBER PUMP CAN BE REPAIRED.

DURING THE LAST HALF OF THE MONTH, MODUELE A OPERATED WHILE MODULE B WAS BEING REPAIRED.

MODULE B PERFORMED SATISFACTIORILY DURING THE FIRST HALF OF THE MONTH, EXPERIENCING ONLY ONE NO DEMAND OUTAGE. ON THE 17TH, HOWEVER, THE SPENT SLURRY VALVE FAILED AND THE MODULE HAS REMAINED OUT OF SERVICE.

1/77	A	98.2	98.7		95.8						
	B	13.5	1.1		1.1						
	SYSTEM							744	722		

** PROBLEMS/SOLUTIONS/COMMENTS

THE 1A1 ABSORBER PUMP WENT OUT IN LATE SEPTEMBER WITH BURNED OUT BEARINGS AND REMAINED OUT THROUGH JANUARY WAITING FOR PARTS.

LOW SULFUR COAL WAS BURNED IN THE BOILER FROM NOVEMBER THROUGH JANUARY.

DUE TO THE LOW VOLUME OF SLUDGE PRODUCED WHILE BURNING LOW SULFUR COAL, MUCH OF THE SLUDGE HANDLING TIME WAS SPENT DIGGING OUT THE ACCUMULATED SLUDGE IN THE RECIRCULATION PONDS. THIS MATERIAL, ALONG WITH SCRUBBER WASTE MATERIAL, WAS TREATED WITH LIME AND FLYASH AND HAULED TO AN OFF SITE DISPOSAL AREA.

MODULE A WAS FORCED OUT ONCE BY A FAILED SPENT SLURRY VALVE.

PLUGGED DEMISTER UNDERSPRAYS CAUSED ANOTHER MODULE A OUTAGE.

MODULE A WENT OUT ONCE BECAUSE OF NO DEMAND AND ONCE DUE TO A BOILER OUTAGE (MODULE B WAS ALREADY OUT OF SERVICE FOR REPAIRS).

MODULE B BECAME AVAILABLE FOR SERVICE ON JANUARY 27, AFTER REPAIRS TO THE SPENT SLURRY VALVE WERE COMPLETED. DUE TO SEVERE WEATHER CONDITIONS, THE MODULE WAS PLACED IN THE GAS PATH JANUARY 31.

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/77	A	38.8	42.6		38.8						
	B	72.0	45.7		41.7						
	SYSTEM							672	613		

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WAS VERY LITTLE DIGGING IN THE RECIRCULATION PONDS. CHICAGO FLYASH SPENT MOST OF THEIR TIME ON CLEANING AND MAINTENANCE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/77	A	96.9	66.7		64.2						
	B	80.9	75.5		73.9						
	SYSTEM							744	728		

** PROBLEMS/SOLUTIONS/COMMENTS

AN ERT SO2 ANALYZER WAS INSTALLED ON THE DISCHARGE SIDE OF MODULE B I.D. BOOSTER FAN. THIS IS AN "IN SITU" ON-DISPERSIVE ANALYZER THAT CONTINUALLY MEASURES AND READS OUT CONCENTRATIONS OF SO2, CO, CO2, AND NO.

AN ABSORBER SUCTION HEADER LEAK FORCED MODULE B FROM THE GAS PATH.

MODULE B WAS FORCED OUT DUE TO A SLURRY VALVE GASKET LEAK.

A PLUGGED FEED SLURRY RECIRCULATION LINE WAS ENCOUNTERED IN MODULE B.

HIGH SULFUR COAL WAS BURNED FOR SEVEN DAYS THIS MONTH TO PROVIDE HIGH SULFUR SLUDGE FOR THE UOP SLUDGE TEST.

CHICAGO FLYASH SPENT 75% OF THEIR TIME DIGGING IN THE POND. THE REST WAS SPENT ON THE THICKENER AND VACUUM FILTER IPERATION. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME FLYASH AND HAULED OFF SITE. DISPOSAL AREA.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/77	A	86.1	67.7		61.2						
	B	45.5	30.2		27.3						
	SYSTEM							720	650		

** PROBLEMS/SOLUTIONS/COMMENTS

THE PERFORMANCE OF THE ERT SO2 ANALYZER TO DATE HAS BEEN, AT BEST, UNRELIABLE AND INCONSISTENT. THE ERT TECHNICIANS ARE OUT TO SERVICE THE ANALYZER ALMOST EVERY OTHER DAY. THE PROBLEM, ACCORDING TO ERT TECHNICIANS, IS OF A "THERMAL NATURE". WHEN THE ANALYZER REACHES A CERTAIN TEMPERATURE, A CHIP SHORTS OUT. THEY HAVE NOT BEEN ABLE TO LOCATE THE FAULTY INTEGRATED CIRCUIT YET.

A BOILER TUBE LEAK REPAIR FORCED MODULE A OUT OF THE GAS PATH ONCE THIS MONTH (MODULE B WAS ALREADY DOWN FOR REPAIRS).

MODULE B WAS FORCED OUT OF THE GAS PATH TWICE FOR AN ABSORBER SUCTION HEADER LEAK REPAIR.

MODULE B WAS OUT OF SERVICE ONCE TO WASH THE I. D. BOOSTER FAN.

CHICAGO ADMIXTURES SPENT MOST OF THEIR TIME DIGGING IN THE SMALL POND, GETTING READY FOR THE MGO ADDITION AND FORCED OXIDATION TEST. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLYASH AND HAULED TO AN OFF SITE DISPOSAL AREA.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/77	A	89.4	2.2		2.0						
	B	98.0	50.9		47.3						
	SYSTEM							744	691		

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE ERT SO2 ANALYZER HAS BEEN REMOVED FROM SERVICE DUE TO A POOR PERFORMANCE RECORD OVER THE LAST THREE MONTHS. ERT IS IN THE PROCESS OF RE-ENGINEERING THEIR ANALYZER.

THE MGO ADDITION TEST WENT WELL. ALTHOUGH THE MGO INCREASED SO2 REMOVAL EFFICIENCY ABOUT 10%, IT DID PRACTICALLY NOTHING FOR THE TWO MORE SERIOUS PROBLEMS, SINCE THICKENER AND SLUDGE PRODUCTION AND LIMESTONE CONSUMPTION RATE WERE ABOUT THE SAME.

MODULE A WAS FORCED OUT OF THE GAS PATH ONCE THIS MONTH WHEN THE INLET VALVE ON 1A2 ABSORBER PUMP FAILED.

MODULE B WAS TAKEN OFF TO CLEAN AND INSPECT THE REHEATER TUBES.

BOTH MODULES WERE FORCED OFF FOR THE FIRST FIFTEEN DAYS OF THE MONTH DUE TO A FAILED 120V CONTROL TRANSFORMER FOR THE POND RETURN PUMPS. THE TRANSFORMER HAD TO BE ORDERED FROM WESTINGHOUSE.

HIGH SULFUR COAL HAS BURNED FOR ELEVEN DAYS DURING THE MONTH.

6/77	A	31.8	13.3		10.5						
	B	93.2	93.4		73.5						
	SYSTEM							720	566		

** PROBLEMS/SOLUTIONS/COMMENTS

THE 1A1 ABSORBER PUMP IS STILL OUT OF SERVICE WAITING FOR PARTS 1A2 ABSORBER PUMP'S ISOLATION VALVES FORCED MODULE A OFF FOR MOST OF THE MONTH.

MODULE A HAD ONE NO DEMAND AND ONE BOILER OUTAGE THIS MONTH.

MODULE B WAS ALSO FORCED OFF TO CLEAN THE I.D. BOOSTER FAN.

NO HIGH SULFUR COAL WAS BURNED THIS MONTH.

7/77	B	70.3	41.4		21.0						
	SYSTEM							744	377		

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH SULFUR COAL HAS BURNED FOR EIGHT DAYS THIS MONTH. LIMESTONE OPERATION WAS NORMAL FOR HIGH SULFUR OPERATION.

MODULE B WAS FORCED OUT OF THE GAS PATH ONCE TO REMOVE A PLUGGED DIFFUSER. THE FINAL TEST, FORCED OXIDATION SEEMDD TO BE THE MOST SUCCESSFUL OF ALL. USING LIQUID OXYGEN, UP TO 12,000 CFM OF GASEOUS O2 WAS FED INTO EACH VENTURI DOWNCOMER, OXIDATION OF SULFITE TO SULFATE WAS INCREASED FROM 35 TO 90 %

MODULE B WAS ALSO FORCED OFF DUE TO A LOW LEVEL IN THE SLURRY STORAGE TANK.

MODULE B WAS ALSO FORCED OFF DUE TO REHEATER TUBE BUNDLE LEAKS.

8/77	A	99.8	99.6		80.8						
	B	9.7	12.0		9.7						
	SYSTEM							744	604		

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS AVAILABLE THE ENTIRE MONTH WITH JUST THE VENTURI PUMP OPERATING.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/77	A	61.0	77.8		54.0						
	B	52.3	75.4		52.3						
	SYSTEM							720	499		

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B ENCOUNTERED HIGH VIBERATIONS IN ITS BOOSTER FAN DURING THE FIRST WEEK OF THE MONTH. AFTER THE FAN WAS BALANCED, THE MODULE OPERATED INTIL THE UNIT OUTAGE ON SEPTEMBER 21.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/77	A	.0			.0						
	B	.0			.0						
	SYSTEM							744	0		
11/77	A	.0			.0						
	B	8.8	50.1		8.8						
	SYSTEM							720	126		

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT ONE CAME UP ON NOVEMBER 25 AFTER A SIXTY-THREE DAY OUTAGE.

MODULE B IS IN THE GAS PATH FATER EXPERIENCING SOME DIFICULTY IN BALANCING ITS BOOSTER FAN.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/77	A	42.5	42.5	47.8	42.5						
	B	84.1	84.1	94.6	84.1						
	SYSTEM							744	661		

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGAGE WAS ENCOUNTERED IN THE MODULE B REHEATER. BECAUSE NO SPARE REHEAT COILS WERE AVAILABLE, THE UTILITY TRIED TAKING SOME COILS FROM MODULE A MODULE B APPEARED TO BE MORE ORE SEVERELY PLUGGED THAN ORIGINALLY THOUGHT.

MODULE A WAS DOWN HALF THE MONTH BECAUSE OF A MAIN STEAM LEAK WHICH COULD NOT BE ISOLATED.

MODULE A OPERATED UNTIL SEPTEMBER 19, WH E A COMBINATION OF MUD AND SCALE BUILD-UP ON THE SUMP FLOOR STRUCTURALLY DAMAGED THE MODULE. REPAIRS PUT THE MODULE OUT OF SERVICE UNTIL MID DECEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/78	A	69.0	89.9		66.3						
	B	22.0	29.8		22.0						
	SYSTEM							744	549		

** PROBLEMS/SOLUTIONS/COMMENTS

ON JANUARY 7, THE MODULE B I.D. BOOSTER FAN DISCHARGE DUCT STARTED VIBRATING WILDLY. THIS FORCED THE BOILER OFF WHILE THE SHOP MADE REPAIRS TO THE DUCTWORK AND BALANCED THE FAN WITH AN I.R.D. MACHINE.

WHEN THE UTILITY ATTEMPTED TO PUT MODULE B BACK IN THE GAS PATH, A LEAK IN THE SLURRY LINE FORCED IT BACK OFF.

A PLUGGED VENTURI PUMP FORCED MODULE B OFF THE REST OF THE MONTH.

DURING THE OUTAGE, THE REHEATER COILS WERE CLEANED WITH A HIGH PRESSURE

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR

(5000 LB) SPRAYER.

MODULE A WAS FORCED OFF WHEN A STEAM REGULATING VALVE BLEW ITS PACKING.

ON THE 23RD, BOTH MODULES WERE TAKEN OFF AND DRAINED TO ALLOW THE SHOP TO INSTALL NEW ISOLATION VALVES IN THE ABSORBER AND VENTURI PUMPS.

TOWARD THE END OF THE MONTH, SOME PROBLEMS WERE ENCOUNTERED WITH THE POND RETURN PUMPS FREEZING.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/78	A	40.9	56.5		34.4						
	B	69.5	92.9		56.5						
	SYSTEM							672	409		

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A RAN INTO DIFFICULT OPERATIONG CONDITIONS THIS MONTH DUE TO RAPID PLUGGING OF THE REHEAT COILS.

INSPECTION AND SUBSEQUENT CLEANING OF MODULE A UNCOVERED PLUGGED SPRAY NOZZLES AND DEMISTER TRAYS DUE TO NOZZLE INEFFICIENCY.

MODULE B OPERATED VERY WELL AND AN INSPECTION SHOWED THE MODULE TO BE VERY CLEAN.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/78	A	93.5	100.0	90.6							
	B	88.5	84.7	76.0	26.2						
	SYSTEM							744	230		

** PROBLEMS/SOLUTIONS/COMMENTS

THIS MONTH, DUE TO COAL CONSERVATION, UNIT 1 WAS ON THE SYSTEM VERY LITTLE.

MODULE B HAD DIFFICULTY FOR SEVERAL DAYS BECAUSE OF A CRACKED SHEAVE ON THE VENTURI PUMP.

HIGH PRESSURE CLEANING ON BOTH MODULES DURING THE COAL CONSERVATION ALONG WITH REMOVING THE VENTURI THROAT RESTRICTOR BLOCKS PROVED BENEFICIAL IN MAINTAINING BETTER CONTROL OF THE DRAFT CONDITIONS IN THE SCRUBBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/78	A	99.9	99.7		92.0						
	B	100.0	99.9		92.2						
	SYSTEM							720	665		

** PROBLEMS/SOLUTIONS/COMMENTS

THE PRESSURE DIFFERENTIAL ACROSS THE VENTURIS HAS BEEN REDUCED BY APPROXIMATELY 40% AT 140 MW BY REMOVING THE VENTURI RESTRICTOR BLOCKS. PARTICULATE REMOVAL AND SOLIDS CARRYOVER COULD BE ADVERSELY AFFECTED BY THIS ACTION. SINCE PARTICULATE REMOVAL AT THE VENTURI IS A FUNCTION OF WATER DROPLET SIZE. WHICH IN TURN IS A FUNCTION OF PRESSURE DROP. INCREASED SOLIDS CARRY-OVER COULD POSSIBLY COMPUND REHEATER PLUGGING PROBLEMS. THE UTILITY IS KEEPING A CLOSE WATCH FOR PLUGGING, BUT HAS NOT YET FOUND ANYTHING UNUSUAL.

MODULE A WAS FORCED OUT OF THE GAS PATH ONCE THIS MONTH FOR A VENTURI PIPE LEAK.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/78	A	9.5	99.4		55.2						
	B	89.2	100.0		56.1						
	SYSTEM							744	413		

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE LAST PART OF THE MONTH BOTH MODULES WERE FORCED OUT OF THE GAS PATH DUE TO REHEATER LEAKS. IT REQUIRED A TWO DAY OUTAGE TO REMOVE THE LEAKING REHEATER BUNDLES. ADDITIONAL REHATERS ARE ON ORDER AND ARE EXPECTED TO ARRIVE IN JUNE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/78	A	87.1	94.5		23.7						
	B	85.6	100.0		25.1						
	SYSTEM							720	181		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING A SCRUBBER INSPECTION, 25% DIEMISTER AND 75% ABSORBER SPRAY PLUGGAGE WAS DISCOVERED IN MODULE A. MODULE B WAS NOT AS BAD.

HIGH VIBRATION WAS ENCOUNTERED IN THE TURBINE BEARINGS DURING BOILER START UP, CAUSING THE BOILER TO SHUT BACK DOWN.

THE PUG MILL FOR CHICAGO ADMIXTURES HAS BEEN APPROVED, AND THE NEW SLUDGE TREATMENT SYSTEM SHOULD BE OPERATING BY FALL.

THE SCRUBBER WAS FORCED OUT OF THE GAS PATH ONCE THIS MONTH WHEN THE 1B1 ABSORBER DISCHARGE VALVE FAILED TO OPEN.

THE BOILER WAS FORCED OFF THE LAST FOUR DAYS OF THE MONTH FOR CYCLONE LEAKS. DURING THIS OUTAGE, THE A AND B MODULE SPENT SLURRY VALVES WERE REPLACED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/78	A	97.0	100.0		11.6						
	B	99.2	100.0		11.6						
	SYSTEM							744	77		

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS PLAGUED ALL MONTH BY CYCLONE CASING LEAKS. BECAUSE OF THE CYCLONE PROBLEMS AND THE COAL CONSERVATION PROGRAM, THE BOILER WAS ONLY OPERATED SEVENTY-SEVEN HOURS FOR THE MONTH.

THE BOILER DOWN TIME WAS USED FOR PREVENTATIVE MAINTENANCE ON THE SCRUBBER. SIX NEW REHEATERS WERE INSTALLED AND A DRAIN VALVE ON THE SPENT SLURRY LINE WAS REPAIRED.

A VALVE FAILURE ON THE 1A1 ABSORBER PUMP FORCED THE SCRUBBER FROM THE GAS PATH ONCE DURING THE MONTH.

MODULE B EXPERIENCED A LEAKING VENTURI HEADER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/78	A	97.8	100.0		59.1						
	B	99.6	100.0		59.1						
	SYSTEM							744	440		

** PROBLEMS/SOLUTIONS/COMMENTS

CHICAGO ADMIXTURES SPENT MOST OF THEIR TIME OPERATING OUT OF THE THICKENER. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLY ASH AND HAULED OFF TO AN OFF SITE DISPOSAL AREA.

REPAIRS TO THE VENTURI EMERGENCY SPRAY VALVE CAUSED ONE BOILER OUTAGE DURING THE MONTH.

A REHEATER FLANGE LEAK WAS RESPONSIBLE FOR FORCING THE UNIT OFF.

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

MODULE A WAS FORCED OFF ONCE DUE TO HIGH VIBRATION OF THE I.D. BOOSTER FAN. THE PROBLEM WAS CORRECTED BY REPACKING THE COUPLING ON THE FAN.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/78	A	77.7	95.9		55.4						
	B	77.7	96.0		55.5						
	SYSTEM							720	416		

** PROBLEMS/SOLUTIONS/COMMENTS

CHICAGO ADMIXTURES SPENT MOST OF THEIR TIME OPERATING OUT OF THE THICKENER. THE SCRUBBER WASTE MATERIAL WAS TREATED WITH LIME AND FLY ASH AND HAULED TO AN OFF SITE DISPOSAL AREA.

REHEATER TUBE LEAKS, ONE IN MODULE A AND FOUR IN MODULE B, CAUSED ONE BOILER OUTAGE AND CAUSED THE FGD SYSTEM TO BE UNAVAILABLE FOR A TOTAL OF NINETY HOURS. SAMPLES OF THE TUBES HAVE BEEN SUBMITTED TO O.A.D. FOR METALLURGICAL EXAMINATION.

A RUPTURED AIR LINE ON A VENTURI PUMP ISOLATION VALVE WOULD NOT ALLOW THE E VALVE TO GO COMPLETELY CLOSED.

WHEN THE A VENTURI PUMP WAS STARTED, A VENTURI SPRAY HOSE RUPTURED.

IT WAS DISCOVERED THAT THE MODULE A VENTURI TANK LEVEL PRESSURE SWITCH WAS NOT WORKING PROPERLY.

THE PUGMILL ORDERED FOR CHICAGO ADMIXTURES HAS ARRIVED ON SITE. IN OCTOBER, THEY WILL FINISH THE CONVERSION, WHICH WILL ALLOW THE MATERIAL SERVICE MIXER TRUCKS TO BE ELIMINATED.

IN OCTOBER, THE THICKENER WILL HAVE TO BE BYPASSED WHILE THE UTILITY DOES MAINTENANCE ON THE RAKE AND REPLACES SOME LEAKING VALVES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/78	A	100.0	100.0		35.0						
	B	100.0	100.0		35.0						
	SYSTEM							744	261		

** PROBLEMS/SOLUTIONS/COMMENTS

LOW BOILER HOURS WERE DUE TO FOUR OUTAGES CAUSED BY HIGH BEARING METAL TEMPERATURES AND EXCESSIVE VIBRATION IN THE 1-B FORCED DRAFT FAN.

THE BOILER DOWN TIME WAS UTILIZED FOR CLEANING AND REPAIR OF THE VENTURI THROAT, SUMP AND SUMP SCREENS, AND INLET BLOCK DAMPERS OF MODULE A, AS WELL AS THE VENTURI AND ABSORBER TANKS AND SCREENS AND ALL ABSORBER SPRAY NOZZLES OF BOTH MODULES.

ON INSPECTION, IT WAS DISCOVERED THAT THE B MODULE ABSORBER DEPARTMENTAL DAMPER HAD SLIPPED 50% CLOSED. THE DAMPERS WERE JACKED OPEN AND WELDED IN PLACE.

TO CORRECT A HIGH PRESSURE DROP ACROSS THE MODULE B REHEATER, A NEW METHOD WAS EMPLOYED WHEREBY ONLY THE MIDDLE TUBES WERE REMOVED, ALLOWING THE TOP AND BOTTOM TUBES TO BE SEEN AND CLEANED, ELIMINATING THE REMOVAL OF ALL THE TUBES. THIS PROCEDURE CUT OUTAGE TIME FROM ONE OR TWO WEEKS TO TWO DAYS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/78	A	96.2	100.0		48.3						
	B	85.2	100.0		48.3						
	SYSTEM							720	348		

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

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------------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL  PER  BOILER  FGD   CAP.
                                                                SO2 PART. HOURS HOURS HOURS FACTOR
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          ** PROBLEMS/SOLUTIONS/COMMENTS

                             THE UNIT WAS DOWN THREE TIMES THIS MONTH DUE TO A VENTURI PUMP AND TWO
                             BOOSTER FAN OUTAGES.

12/78  A           65.3        100.0                     64.5
       B           64.5        100.0                     64.5
       SYSTEM                                                                744   480

          ** PROBLEMS/SOLUTIONS/COMMENTS

                             REHEATER TUBE LEAKS CAUSED TWO OUTAGES.

                             THE MODULE B SPENT SLURRY DRAIN WAS REPAIRED.

 1/79  A           83.5        100.0                     61.3
       B           62.2         87.1                     53.4
       SYSTEM                                                                744   456

          ** PROBLEMS/SOLUTIONS/COMMENTS

                             THE SO2 PLANT WAS FORCED OFF TWICE THIS MONTH DUE TO REHEATER TUBE LEAKS.
                             TWO TUBES ON MODULE A AND FOUR TUBES ON MODULE B WERE REPLACED.

                             THE I.D. BOOSTER FAN ON MODULE B WAS FOULED AND HAD TO BE REPLACED.

                             TWO SPECIAL SECTIONS OF VENTURI PIPING, A SIXTEEN TO EIGHT INCH ECCENTRIC
                             REDUCER AND AN OFFSET TEE WERE PREPARED BY LOCKPORT FABRICATING AND INSTAL-
                             LED THIS MONTH. THE ORIGINAL REDUCER AND TEE HAD BEEN PATCHED AND WELDED SO
                             MANY TIMES THAT THEY WERE BEYOND REPAIR.

 2/79  A           93.0         91.3                     54.2
       B           93.0         91.3                     54.2
       SYSTEM                                                                672   399

          ** PROBLEMS/SOLUTIONS/COMMENTS

                             THE UNIT WAS FORCED OFF ONCE FOR A MAIN STEAM HEADER LEAK.

 3/79  A          100.0        100.0                     46.0
       B           68.6        100.0                     46.0
       SYSTEM                                                                744   343

          ** PROBLEMS/SOLUTIONS/COMMENTS

                             THE SYSTEM WAS FORCED OUT TWICE IN FEBRUARY AND FOUR TIMES IN MARCH DUE   E
                             TO A VENTURI HEADER LEAK. A TEN FOOT SECTION OF PIPE WILL HAVE TO BE
                             REPLACED DUE TO EXTENSIVE CORROSION.

                             THE SYSTEM WAS DOWN ONCE FOR A SPRAY HEADER LEAK.

                             MODULE B EXPERIENCED A LEAK IN THE VENTURI DOWNCOMER. A FIVE FOOT SECTION
                             OF THE PIPE WILL HAVE TO BE REPLACED.

 4/79  A
       SYSTEM                                                                720

 5/79  A                                                    .0
       B                                                    .0
       SYSTEM                                                                744     0
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PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS OUT OF SERVICE THE ENTIRE MONTH DUE TO A BOILER OVERHAUL.

CHICAGO ADMIXTURES WILL STOCKPILE THE FIXED SLUDGE ON STATION PROPERTY.

6/79	SYSTEM							720	0		
7/79	SYSTEM							744	0		
8/79	SYSTEM							744	0		

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS OUT OF SERVICE TO REPLACE THE AIR HEATER TUBES, TUBE SHEET AND HOPPERS. DURING THIS OUTAGE, THE WORN VENTURI SPRAY NOZZLES AND DEMISTERS WERE REPLACED. WELDING LEAKS AND GENERAL CLEANING OF THE SO2 INTERNALS WAS ALSO DONE AT THIS TIME.

THE BOILER AND THE SCRUBBER ARE SCHEDULED TO RETURN TO SERVICE OCTOBER 1, 1979.

9/79	SYSTEM							720	0		
10/79	SYSTEM							744	0		
11/79	A	53.3	100.0		85.4						
	B	53.3	100.0		85.4						
	SYSTEM	53.3	100.0		85.4			720	336	336	

** PROBLEMS/SOLUTIONS/COMMENTS

ON NOVEMBER 5, UNIT 1 RETURNED TO SERVICE AFTER A SIX MONTH OUTAGE TO REPLACE THE AIR HEATER TUBES, TUBE SHEET AND HOPPERS.

DURING THE OUTAGE, SEVERAL LENGTHS OF VENTURI PIPING HAD TO BE REPLACED WITH NEW RUBBER LINED PIPE.

THE UNIT DID NOT FORCE THE BOILER OFF AT ANY TIME DURING NOVEMBER.

12/79	A	77.0	99.5		57.5						
	B	84.9	100.0		57.8						
	SYSTEM	77.0	99.5		57.5			744	431	428	

** PROBLEMS/SOLUTIONS/COMMENTS

ON DECEMBER 4, UNIT 1 CAME OFF LINE SO THAT THE AIR HEATER HOPPERS AND PRECIPITATOR HOPPERS COULD BE EMPTIED OF CARBON CARRY-OVER AND DEBRIS. DURING THIS OUTAGE THE SHOP REPAIRED A LEAK IN THE POND RETURN LINE.

ON DECEMBER 10, THE A-MODULE DEVELOPED A SERIOUS STEAM LEAK (25,000 MAKE-UP) IN A LOWER REHEAT BUNDLE. THE LEAKING BUNDLE HAD TO BE REMOVED AND REPLACED. THIS RESULTED IN A TWO DAY FORCED OUTAGE. LATER IN THE MONTH THE A-MODULE BLEW ANOTHER REHEATER TUBE FORCING THE BOILER OFF FOR AN ADDITIONAL 25 HOURS AND 12 MINUTES.

THE A-MODULE WAS REMOVED FROM THE GAS PATH ON DECEMBER 29, FOR THREE HOURS TO ALLOW THE MAINTENANCE SHOP TO WELD A LEAKING REHEATER FLANGE.

THE SO2 PLANT FORCED THE BOILER OFF TWICE THIS MONTH. TOTAL FORCED OUTAGE TIME ATTRIBUTED TO THE SCRUBBER WAS 54 HOURS AND 39 MINUTES.

1/80	A	91.0	87.5		63.0						

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	88.6	84.1		60.6						
	SYSTEM	88.6	84.1		60.6			744	536	451	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST SIX DAYS OF JANUARY, UNIT 1 BOILER WAS OFF THE SYSTEM BECAUSE OF A SLAG SCREEN TUBE LEAK. THE UNIT RETURNED TO SERVICE ON JANUARY 7.

ON JANUARY 16, THE UTILITY HAD TO DERATE UNIT 1 TO 50 MW BECAUSE THE REHEATER SECTIONS ON A AND B MODULES WERE PLUGGING. ON JANUARY 17, THE MODULES WERE TAKEN OUT OF THE GAS PATH TO BEGIN REMOVING AND CLEANING THE REHEATER SECTIONS WITH A HIGH PRESSURE (4000 PSI) WATER SPRAY. UNIT 1 BOILER WAS LEFT ON TO PROVIDE STABILITY FOR THE 138 KV SYSTEM.

IN THE PAST, ALL 42 BUNDLES CONSISTING OF SEVEN TUBES PER BUNDLE, HAD TO BE TAKEN OUTSIDE TO BE CLEANED ON A CONCRETE SLAB. IN THIS CASE SINCE TIME WAS THE MOST IMPORTANT FACTOR, A DIFFERENT APPROACH WAS USED. ONLY THE MIDDLE SIX BUNDLES ON EACH MODULE WERE REMOVED. THIS PROVIDED A LARGE ENOUGH SPACE SO THAT A LANCE WITH AN EXTENSION ON IT COULD BE USED TO CLEAN THE BOTTOM OF THE TWO TOP BUNDLES AND THE TOP OF THE TWO BOTTOM BUNDLES. THERE ARE DOORS THAT ALLOW EASY ACCESS TO THE TOP AND BOTTOM OF THE REHEATER. USING THIS METHOD, ONLY 12 OR THE 42 BUNDLES WERE REMOVED. IN THE PAST, THIS JOB HAS TAKEN AS LONG AS TWO WEEKS TO COMPLETE. USING THE NEW METHOD, ALL THE REHEATER BUNDLES WERE CLEANED IN 20 HOURS.

THE B-MODULE WAS FORCED OFF LINE ON TWO OTHER OCCASIONS IN JANUARY. BOTH THESE OUTAGES WERE CAUSED BY THE REHEATER (A COIL LEAK AND A FLANGE LEAK) TOTALING 18 HOURS AND 24 MINUTES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/80	A	79.7	90.5		79.7						
	B	78.6	89.2		78.6						
	SYSTEM	74.1	84.2		74.1			696	613	516	

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER PROBLEMS IN FEBRUARY WERE CAUSED FROM LEAKS IN THE VENTURI SPRAY HEADER. THESE LEAKS DEVELOP WHERE THE RUBBER LINING INSIDE THE VENTURI PIPING HAS WORN AWAY SO THAT THE BARE METAL IS EXPOSED. THIS EXPOSED METAL IS THEN SUBJECT TO ERROSION/CORROSION. THE LINING IS MOST LIKELY TO WEAR AT THE WELD HEAD OF THE SPRAY NOZZLE TO THE MAIN HEADER. ALL THE VENTURI SPRAY PIPING IS BEING REPLACED.

TUBE LEAKS IN THE STEAM COIL REHEAT SYSTEM CAUSED SCRUBBER PROBLEMS THIS MONTH. MODULE A WAS FORCED OUT ONCE AND MODULE B WAS FORCED OUT THREE TIMES. THESE TUBES WILL BE REPLACED DURING THE NEXT OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/80	A	83.9			.0						
	A	83.9			.0						
	SYSTEM	83.9			.0			744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE FOR ALL OF MARCH DUE TO BOILER TUBE LEAKS IN THE REHEAT SECTION OF THE BOILER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	A	100.0	71.0		17.3						
	B	87.7	71.0		17.3						
	SYSTEM	93.9	71.4		17.3			720	175	125	

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST 15 DAYS OF APRIL THE BOILER WAS OUT OF SERVICE DUE TO TUBE LEAKS IN THE AIR PREHEATER.

WHEN ATTEMPTS WERE MADE TO BRING THE BOILER ON LINE ON THE 16 THE B-MODULE OF THE SO2 SYSTEM DEVELOPED REHEATER TUBE LEAKS. THIS CAUSED A FORCED OUTAGE OF 53 HOURS AND 40 MINUTES.

WHEN ATTEMPTS WERE MADE TO RETURN THE BOILER TO SERVICE AGAIN, THE AUXILIARY LOW PRESSURE GOVENOR DEVELOPED AN OIL LEAK CAUSING A FOUR DAY OUTAGE, FOLLOWED BY ANOTHER REHEATER TUBE LEAK OUTAGE ON THE B MODULE. THIS OUTAGE LASTED 35 HOURS. THE UNIT RETURNED TO SERVICE ON APRIL 24 AND WAS AVAILABLE FOR THE REST OF APRIL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS NOT AVAILABLE FOR THE MONTH OF MAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/80	A	86.5	100.0		81.2						
	B	86.5	100.0		81.2						
	SYSTEM	86.5	100.0		81.2			720	584	584	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM FORCED THE BOILER OUT OF SERVICE FROM JUNE 6 TO JUNE 10. THE OUTAGE WAS CAUSED BY PLUGGED REHEATERS ON BOTH MODULES. THIS WAS THE ONLY FORCED OUTAGE EXPERIENCED DURING JUNE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	A	87.8	78.3		55.0						
	B	87.8	78.3		55.0						
	SYSTEM	87.8	78.3		55.0			744	522	409	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF JULY THERE WERE NO FORCED SCRUBBER OUTAGES.

TWO SLAG LINE OUTAGES, ONE FORCED DRAFT FAN AND ONE BOILER SCREEN WALL TUBE OUTAGE OCCURRED. THIS ACCOUNTED FOR 193 HOURS OF BOILER-RELATED OUTAGE TIME DURING THE MONTH.

ON NINE OCCASIONS IN JULY THE SCRUBBER WAS BY-PASSED SO THAT THE BOILER COULD CARRY MAXIMUM LOAD (163 MW). THE UNIT WAS LIMITED TO 135 MW AFTER A RECENT STACK EMISSION TEST.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE MONTHS OF AUGUST AND SEPTEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	A	69.9	100.0		60.9						
	B	69.9	100.0		60.9						
	SYSTEM	69.9	100.0		60.9			744	453	453	

COMMONWEALTH EDISON: WILL COUNTY 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THERE WAS ONE FORCED OUTAGE DUE TO PROBLEMS WITH THE ABSORBER RECIRCULATION PUMP ON MODULE B. DURING THIS OUTAGE THE WALL WASH HEADERS WERE REPLACED ON BOTH MODULES.

DURING OCTOBER THE BOILER WAS SHUT DOWN TWICE DUE TO A LACK OF DEMAND. THIS ACCOUNTED FOR APPROXIMATELY 51 HOURS OF DOWN TIME. ADDITIONAL UNIT OUTAGE TIME WAS DUE TO INTERCEPT VALVE AND AIR HEATER PROBLEMS.

11/80	A	92.4	100.0	83.4	33.0						
	B	92.4	100.0	83.4	33.0						
	SYSTEM	92.4	100.0	83.4	33.0			720	238	238	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WITH THE SCRUBBING SYSTEM WERE ENCOUNTERED DURING NOVEMBER.

12/80	A	77.9	100.0	31.5	31.5						
	B	77.9	100.0	31.5	31.5						
	SYSTEM	77.9	100.0	31.5	31.5			744	234	234	20.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER AVAILABILITY OF THE FGD SYSTEM WAS LOW DUE TO PLUGGED VENTURI NOZZLES AND HEADER, WHICH HAD TO BE HIGH-PRESSURE JETTED.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	DETROIT EDISON	
PLANT NAME	ST. CLAIR	
UNIT NUMBER	6	
CITY	BELLE RIVER	
STATE	MICHIGAN	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	86.	(.200 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	1376.	(3.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1798	
GROSS UNIT GENERATING CAPACITY - MW	260	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	163	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	******	
BOILER SERVICE LOAD	PEAK	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	465.77	(987000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	130.	(425 FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	22330.	(9600 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9,500 - 9,600
AVERAGE ASH CONTENT - %	4.00	
RANGE ASH CONTENT - %	3.0-4.0	
AVERAGE MOISTURE CONTENT - %	22.60	
RANGE MOISTURE CONTENT - %	22 - 24	
AVERAGE SULFUR CONTENT - %	.35	
RANGE SULFUR CONTENT - %	0.3 - 0.4	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
SUPPLIER	WHEELABRATOR-FRYE	
PARTICLE REMOVAL EFFICENCY - %	90.0	
** PARTICLE SCRUBBER		
NUMBER	2	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/ADJUSTABLE DRUM	
SUPPLIER	PEABODY-LURGI	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	RUBBER	
GAS CONTACTING DEVICE TYPE	RUBBER LINED CARBON STEEL & 316L SS	
LIQUID RECIRCULATION RATE - LITER/S	278.5	(4420 GPM)
L/G RATIO - LITER/CU.M	2.7	(20.0 GAL/1000ACF)
PRESSURE DROP - KPA	3.5	(14.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	28.3	(93.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	116.6	(247000 ACFM)

INLET GAS TEMPERATURE - C 132.2 (270 F)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/74	SYSTEM							720			
12/74	SYSTEM							744			
1/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INSTALLATION OF THE FGD SYSTEM WAS ESSENTIALLY COMPLETED BY THE NOVEMBER, 1974 THROUGH JANUARY 1975 PERIOD.

A FAULTY INSTRUMENT PANEL WHICH WAS INCORRECTLY WIRED HAS BEEN RETURNED TO THE MANUFACTURER FOR REPAIR.

TO DATE, THE UTILITY HAS WATER TESTED ALL THE AUXILIARY EQUIPMENT. THE ID FAN HAS BEEN TESTED AND AIR BALANCE HAS BEEN CHECKED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/75	SYSTEM							672			
3/75	SYSTEM							744			
4/75	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

A COLD FLUE GAS RUN WAS SUCCESSFULLY CONDUCTED MARCH 22 AND 23. DURING THIS PERIOD THE RUBBER-LINED PUMPS WERE REPAIRED AND THE LIMESTONE PREARATION SYSTEM WAS CALIBRATED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/75	SYSTEM							744			
6/75	SYSTEM							720			
7/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST HOT FLUE GAS RUN WAS CONDUCTED ON JUNE 22, 1975. THE RUN LASTED FOR A PERIOD OF 22 HOURS. DURING THIS RUN, THE SCRUBBER WAS PURPOSELY TRIPPED OFF AT LOADS OF 40 AND 80 PERCENT. THIS WAS PERFORMED TO OBSERVE IF ANY DETRIMENTAL EFFECTS TO THE STEAM GENERATION OPERATIONS RESULTED. NONE WERE DETECTED. THE SYSTEM WAS TAKEN OUT OF SERVICE FOLLOWING THIS GAS RUN TO CORRECT THE FOLLOWING MAJOR OPERATION AREAS:

GAS CIRCUIT: LUGI THROAT POSITIONAL FAILURE; DETERIORATION OF THE DAMPER SEALS; SEVERE VIBRATIONS; SO2 ANALYZERS INOPERATIVE.
LIQUID CIRCUIT: FAILURE OF PH CONTROL SYSTEM; TARGET FLOW METER TARGETS HAVE BEEN BROKEN OFF; PUMP SEAL WATER LOW FLOW ALARM TRIPS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/75	SYSTEM							744			
9/75	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

A SECOND HOT FLUE GAS RUN WAS INITIATED ON AUGUST 6 AND LASTED 27 HOURS. THE RUN WAS TERMINATED BECAUSE OF A REHEATER THERMOCOUPLE FAILURE. A SUBSEQUENT INSPECTION OF THE SCRUBBING SYSTEM REVEALED NO APPARENT ABNORMALITIES OR MALFUNCTIONS.

A THIRD HOT FLUE GAS RUN OF 41 HOURS DURATION WAS COMPLETED OCTOBER 9. THE MAIN OBJECTIVE OF THIS RUN WAS TO EVALUATE VARIOUS COMPONENTS OF THE FRESH WATER SPRAY SYSTEM AND EFFECTS ON SYSTEM OPERATION. THE TEST RUN WAS

DETROIT EDISON: ST. CLAIR 6 (CONT.)

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------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER FGD    CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                         PREMATURELY TERMINATED BECAUSE OF A BOILER FEED PUMP MALFUNCTION, RESULTING
                         IN A REDUCED BOILER LOAD CAUSING SUBSEQUENT WEEPING OF THE WASH TRAY.

10/75 SYSTEM                                                                 744

11/75 SYSTEM                                                                 720

12/75 SYSTEM                                                                 744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         A FOURTH FLUE GAS RUN OF 23 DAYS DURATION WAS TERMINATED DUE TO EXCESSIVE
                         VIBRATION IN THE I.D. & BOOSTER FAN.  ONE OTHER SCRUBBER-RELATED OUTAGE
                         OCCURRED WHEN THE PACKING OF ONE OF THE SCRUBBER RECIRCULATION PUMPS NEEDED
                         MAINTENANCE.  SO2 REMOVAL DURING THIS PERIOD WAS 90 PERCENT AND PARTICULATE
                         OUTLET LOADING WAS 0.1 LB/1000 LBS OF FLUE GAS FOR 1-3 PERCENT SULFUR COAL.

 1/76 SYSTEM                                                                 744

 2/76 SYSTEM                                                                 696

 3/76 SYSTEM                                                                 744

 4/76 SYSTEM      100.0       100.0                                          720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE 30-DAY VENDOR QUALIFICATION RUN AND FINAL ACCEPTANCE TEST WERE
                         COMPLETED BY MAY 29.  THE QUALIFICATION RUN WAS CONDUCTED ON A "HANDS OFF"
                         BASIS USING PLANT PERSONNEL EXCLUSIVELY.  THE SYSTEM WAS IN SERVICE 100
                         PERCENT OF THE TIME THE BOILER WAS OPERATIONAL.  THE FINAL ACCEPTANCE TEST
                         CONSISTED OF SIX 4-HR. TEST RUNS CONDUCTED IN THE SPACE OF ONE WEEK.  THE
                         SO2 REMOVAL EFFICIENCY FOR HIGH SULFUR COAL WAS 90.9 PERCENT.  PARTICULATE
                         REMOVAL ALSO EXCEEDED DESIGN LEVELS.  NO MAJOR CHEMICAL OR MECHANICAL-
                         RELATED PROBLEMS WERE ENCOUNTERED.

 5/76 SYSTEM                                                                 744

 6/76 SYSTEM                                                                 720

 7/76 SYSTEM                                                                 744

 8/76 SYSTEM                                                                 744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE UTILITY IS NOW PREPARING TO CONDUCT A 2 MONTH MINIMUM INTERNAL SCRUBBER
                         DEMONSTRATION PROGRAM TO ACQUIRE OPERATING DATA AND INFORMATION.  FOLLOWING
                         THE COMPLETION OF THIS PROGRAM THE BOILERS WILL FIRE LOW SULFUR DECKER
                         COAL (0.3 TO 4.0 PERCENT) TO MEET SO2 EMISSION REGULATIONS.  THE SCRUBBERS
                         WILL CONTINUE TO OPERATE IN THE PARTICULATE REMOVAL MODE.

 9/76 SYSTEM                                                                 720

10/76 SYSTEM                                                                 744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE INTERNAL SO2 SCRUBBING DEMONSTRATION PROGRAM COMMENCED ON OCTOBER 14.
                         THE SCRUBBERS OPERATED CONTINUOUSLY FOR 10 DAYS.

                         OPERATION ON THE DEMONSTRATION PROGRAM WAS INTERRUPTED BY A FORCED SCRUBBER
                         OUTAGE RESULTING FROM SCALE AND SOLIDS CARRYOVER FROM THE WASH TRAY AND
                         MIST ELIMINATOR TO THE SCRUBBER I.D. BOOSTER FAN ASSEMBLY, CAUSING VIBRA-
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--------------------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                                  TION AND BALANCE PROBLEMS.  IT WAS DECIDED TO SANDBLAST THE FAN TO REMOVE
                                  SOLIDS BUILDUP ON THE FAN ASSEMBLY.

                                  THE UTILITY PLANS TO MODIFY THE COMPONENT'S WASH SYSTEM FOR GREATER FLOW
                                  CAPABILITY AFTER COMPLETION OF THE SO2 SCRUBBING PROGRAM.  DECO ALSO PLANS
                                  TO CONTINUE PARTICULATE SCRUBBING FOLLOWING THE TERMINATION OF THE SO2
                                  PROGRAM BY UNCOUPLING THE SPRAY TOWERS AND MAINTAINING THE PEABODY-LURGI
                                  VENTURI SCRUBBERS IN THE FLUE GAS STREAM.  SOME LIMESTONE MAY HAVE TO BE
                                  ADDED TO THE PARTICULATE SCRUBBING SOLUTION IN ORDER TO PREVENT LOW PH
                                  SWINGS AND MINIMIZE THE POSSIBILITY OF ACID CORROSION DAMAGE TO THE
                                  INTERNAL COMPONENTS.

11/76  SYSTEM      80.0                                                        720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                                  FOLLOWING THE COMPLETION OF SAND BLASTING OPERATIONS TO SCRUBBER'S I.D.
                                  BOOSTER FAN FOR REMOVAL OF SOLIDS BUILD UP, OPERATIONS RESUMED ON NOVEMBER
                                  7 AND CONTINUED THROUGHOUT THE MONTH.  THE SYSTEM'S AVAILABILITY INDEX FOR
                                  THE MONTH WAS 80 PERCENT.  THE MAJORITY OF THE OUTAGE TIME WAS CONSUMED
                                  PROCURING SAND BLASTING SERVICES.  THE OPERATION ITSELF REQUIRED ONLY 8
                                  HOURS.

12/76  SYSTEM      51.0                                                        744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                                  THE SO2 DEMONSTRATION PROGRAM CONTINUED THROUGHOUT DECEMBER.  THE SYSTEM'S
                                  AVAILABILITY INDEX FOR THE PERIOD WAS 51 PERCENT.

                                  SCRUBBER OUTAGES RESULTED FROM LIMESTONE FEEDER PROBLEMS.

                                  SCRUBBER OUTAGES RESULTED FROM DENSE SLURRY TRAVERSE PUMP PROBLEMS.

                                  SCRUBBER OUTAGES RESULTED FROM DENSE SLURRY TANK AGITATOR MALFUNCTIONS.

                                  PH SAMPLING LINE PLUGGING RESULTED IN SOME OUTAGE TIME.

 1/77  SYSTEM        .0                                                        744

 2/77  SYSTEM        .0                                                        672

       ** PROBLEMS/SOLUTIONS/COMMENTS

                                  THE SO2 DEMONSTRATION PROGRAM WAS OFFICIALLY TERMINATED ON DEC. 31, 1976.
                                  THE SCRUBBER PLANT WAS SHUT DOWN AT THIS POINT AND FLUE GAS WAS BY-PASSED
                                  AROUND THE SYSTEM.

 3/77  SYSTEM        .0                                                        744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                                  THE BOILER REMAINS IN SERVICE, FIRING LOW SULFUR (0.3%) WESTERN COAL.
                                  CURRENT PLANS CALL FOR THE SCRUBBER PLANT TO REMAIN OUT OF SERVICE UNTIL
                                  MID-JUNE FOR DESIGN AND OPERATING MODIFICATIONS.  RESUMPTION OF SCRUBBER
                                  OPERATIONS WILL OCCUR IN THE PRIMARY PARTICULATE-REMOVAL MODE.  THE
                                  PEABODY-LURGI VENTURI SCRUBBERS AND SPRAY TOWER ABSORBERS WILL REMAIN IN
                                  THE GAS STREAM.  SOLUTION WILL BE CIRCULATED THROUGH THE VENTURI'S WASH
                                  TRAYS, AND MIST ELIMINATORS.  NO SOLUTION WILL BE CIRCULATED THROUGH THE
                                  SPRAY ZONE OF THE ABSORBER TOWERS.  LIMESTONE REAGENT WILL BE ADDED TO THE
                                  SCRUBBING SOLUTION IN ORDER TO PREVENT LOW PH SWINGS AND SUBSEQUENT
                                  MATERIALS DAMAGE TO THE SCRUBBER'S INTERNALS.  SO2 REMOVAL SHOULD RESIDE
                                  IN THE 35 TO 50% RANGE IN THIS MODE OF OPERATION BECAUSE OF THE SOLUTION'S
                                  ALKALINITY DUE TO THE FLY ASH AND LIMESTONE.  ALSO DECO PLANS TO MAINTAIN
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DETROIT EDISON: ST. CLAIR 6 (CONT.)

PERFORMANCE DATA

A HIGHER L/G RATIO IN THE SCRUBBER MODULES. THIS MODE OF OPERATION IS PROJECTED TO CONTINUE FOR A ONE TO THREE YEAR PERIOD FOLLOWING THE MID-JUNE RESTART.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/77	SYSTEM	.0						720			
5/77	SYSTEM	.0						744			
6/77	SYSTEM	.0						720			
7/77	SYSTEM	.0						744			
8/77	SYSTEM	.0						744			
9/77	SYSTEM	.0						720			
10/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS PULLED OFF LINE IN DECEMBER 1976 AND DID NOT RESTART UNTIL OCTOBER 1977. WHILE THE UNIT WAS DOWN THE UTILITY INSTALLED BUILDINGS AROUND PUMPS THAT WERE EXPOSED TO SEVERE WEATHER CONDITIONS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/77	SYSTEM							720			
12/77	SYSTEM							744			
1/78	SYSTEM							744			
2/78	SYSTEM	96.0						672			
3/78	SYSTEM	85.6						744			
4/78	SYSTEM	90.0						720			
5/78	SYSTEM	74.6						744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT EXPERIENCED SPRAY HEADER PROBLEMS IN THE ABSORBER TOWER. SOME BROKEN NOZZLES WERE DISCOVERED.

THERE WERE SOME I.D. BOOSTER FAN PROBLEMS. THE UTILITY MUST SAND BLAST THE FAN EVERY 4 TO 5 WEEKS WHEN THE MAGNITUDE OF VIBRATION OF THE FAN BECOMES EXCESSIVE FROM SCALE FORMATION; HOWEVER, IN THIS INSTANCE THE PROBLEM WAS A RESULT OF A LOW FAN OIL LEVEL.

THE UTILITY NOW OPERATES 3 RECYCLE TANK AGITATORS. PREVIOUSLY ONLY 2 WERE OPERATED. IT WAS FELT THAT PART OF THE TANK PLUGGING WAS A RESULT OF INSUFFICIENT AGITATION.

THE SLURRY SPRAY SURGE TANK ENCOUNTERED CONTINUAL OVERFLOW PROBLEMS WHEN THE ABSORBER SUMP PUMP WAS OPERATING. THIS WAS BELIEVED TO BE A RESULT OF A BROKEN SECTION IN THE SPRAY NOZZLE LINES. SPRAY WAS BEING DIRECTED UPWARD TO THE BOTTOM OF A TRAY INSTEAD OF DOWN, COUNTERCURRENT TO THE GAS FLOW AS INTENDED.

REHEATER PROBLEMS OCCURRED WITH THE FORMATION OF OIL CLINKERS IN THE BURNER AREA. IT WAS DISCOVERED THAT THE AIR SUPPLY TO THE BURNER WAS INSUFFICIENT.

SOME SPRAY HEADER PROBLEMS WERE ENCOUNTERED. THE FRP PIPING WAS RUPTURING. IT WAS SUSPECTED THAT THE RUPTURES WERE A RESULT OF "WATER HAMMER" I.E.

DETROIT EDISON: ST. CLAIR 6 (CONT.)

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------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                          THE SURGE THAT OCCURRS IN THE PIPE WITH A SUDDEN FLOW RATE CHANGE.

                          THE SPRAY HEADERS WERE PLUGGING.  WHEN THE HEADERS ARE DRAINED (E.G.
                          SYSTEMS SHUTDOWN) SOME SLURRY SETTLES IN THE HEADER LINES ETC.  RINSE LINES
                          ARE NOW BEING INSTALLED TO FLUSH OUT HEADERS DURING FUTURE SHUTDOWNS.

 6/78  SYSTEM      87.9                                                     720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          ONE OF THE BLADES CAME LOOSE FROM AN I.D. BOOSTER FAN AND PASSED THROUGH
                          THE HOUSING.  REPAIRS WERE MADE WITHOUT SERIOUS COMPLICATIONS.

 7/78  SYSTEM      96.0                                                     744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          THE INSTALLATION OF RINSE LINES HAS NOT YET BEEN COMPLETED.

                          PROBLEMS WITH RUPTURED SPRAY HEADER PIPING CONTINUED.  IT HAS BEEN POSSIBLE
                          TO OPERATE THE SCRUBBER WITH THE RUPTURED LINES WITHOUT SERIOUS
                          CONSEQUENCES.  IT IS NOT CRUCIAL THAT REPAIRS BE MADE IMMEDIATELY.

 8/78  SYSTEM      90.4                                                     744

 9/78  SYSTEM      69.0                                                     720

10/78  SYSTEM        .0                                                     744

11/78  SYSTEM        .0                                                     720

12/78  SYSTEM        .0                                                     744

 1/79  SYSTEM                                                               744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          DURING THIS PERIOD RECYCLE TANK AGITATORS WERE BREAKING LOOSE AND SIMILAR
                          PROBLEMS WERE ENCOUNTERED WITH THE SLURRY STORAGE TANK AGITATORS.  THE
                          SCRUBBING SYSTEM WAS REMOVED FROM SERVICE FROM SEPTEMBER THROUGH JANUARY.
                          STEADY BEARINGS WERE INSTALLED AT THE BOTTOM OF THE RECYCLE TANK SOLVING
                          THE RECYCLE TANK AGITATOR PROBLEM.  THE SLURRY STORAGE TANK SYSTEM ALREADY
                          HAD STEADY BEARINGS.  THESE WERE REWORKED TO IMPROVE OPERATIONS.

 2/79  SYSTEM                                                               672

 3/79  SYSTEM                                                               744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          SOME REHEATER PROBLEMS OCCURRED.

 4/79  SYSTEM                                                               720

 5/79  SYSTEM                                                               744

 6/79  SYSTEM                                                               720

 7/79  SYSTEM                                                               744

 8/79  SYSTEM                                                               744

 9/79  SYSTEM                                                               720

10/79  SYSTEM                                                               744
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DETROIT EDISON: ST. CLAIR 6 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM IS CURRENTLY DOWN BUT IS EXPECTED TO BE BACK ON LINE SOON. THE SCRUBBING SYSTEM HAS OPERATED ONLY 1 WEEK SINCE MAY 18, 1979 BECAUSE OF SUMP PROBLEMS.
THE AGITATOR BEARING SYSTEM WAS POORLY DESIGNED. THE BEARING SYSTEM HAS NOW BEEN COMPLETELY REDESIGNED. THE AGITATORS HAVE NOW OPERATED 2000 HOURS ON THE NEW BEARINGS. THE UTILITY WILL PROBABLY DRAIN THE TANK AFTER ABOUT 500 MORE HOURS TO INSPECT AND READJUST THE BEARINGS. THE NEW BEARING SYSTEM IS COMPOSED OF STAINLESS STEEL PARTS.
100% OF THE ST. CLAIR FLUE GAS PASSES THROUGH THE ESP. 50% OF THAT FLUE GAS ENTERS THE SCRUBBER. THE UNIT IS REQUIRED TO MEET A 55% OPACITY, HOWEVER, A VARIANCE HAS BEEN GRANTED ALLOWING A 65% OPACITY UNTIL THE SCRUBBER IS AGAIN OPERATIONAL. THE UTILITY IS PREPARING TO INSTALL A NEW ESP WHICH WOULD BE OPERATIONAL IN 2 YEARS. WHEN THE NEW ESP IS INSTALLED THE SCRUBBING SYSTEM AND OLD ESP WILL BE SCRAPPED. THE UNIT WILL THEN BE REQUIRED TO MEET A 20% OPACITY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	SYSTEM	90.0						720			
12/79	SYSTEM	90.0						744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CAME BACK ON LINE AROUND MID-NOVEMBER.

NEW DENVER PUMPS WITH EJECTORS WERE INSTALLED TO ASSIST THE SUMP PUMPS UNTIL THE ESP'S COME ON LINE.

THE ABSORBER PUMPS HAVE BEEN A PROBLEM RESULTING IN A CAPACITY TURNDOWN TO 225 MW (FROM 230 MW).

ONE OF THE COAL MILLS HAS BEEN DOWN CAUSING LIMITED OPERATIONS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM OPERATED WITH BETTER THAN 80% AVAILABILITY DURING THE FIRST QUARTER OF 1980.

THE SCRUBBER ID FAN FAILED. THE BOLTS HOLDING PART OF THE SHROUDING IN PLACE SHEERED CAUSING THE PLATE TO FALL ONTO THE SHAFT.

BECAUSE OF ADDITIONAL PROBLEMS WITH THE A-S-H SUMP PUMPS, THE DENVER PUMPS INSTALLED TO ASSIST THE A-S-H PUMPS NOW CARRY THE ENTIRE LOAD. THE A-S-H PUMPS DRIVES HAVE BEEN DISCONNECTED. THE SLURRY CIRCULATES THROUGH THE THE NON-OPERATING A-S-H PUMPS TO THE DENVER PUMPS.

THE CONTINUAL PROBLEMS WITH THE LOUVER BY PASS DAMPERS WAS SOLVED BY DISCONNECTING THE EXTREME LOUVER AT EITHER END. THE DAMPERS OPERATE NOW WITH 12 OF THE 14 LOUVERS. THE UTILITY IS PLEASED WITH RECENT DAMPER OPERATIONS.

SOME RECENT SCRUBBER OUTAGES RESULTED FROM THE OCCASIONAL UNAVAILABILITY OF LIMESTONE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM							720			

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS OUT OF SERVICE THROUGH APRIL WHILE REPAIRS CONTINUED ON THE SCRUBBER ID FAN HOUSING. BECAUSE BOILER OPERATED AT LOW LOAD THE SCRUBBER SERVICES WERE NOT REQUIRED IN APRIL.

5/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS OUT OF SERVICE UNTIL MAY 21 WHEN THE FAN HOUSING REPAIR WAS COMPLETED. THE SCRUBBER WAS SHUT DOWN AGAIN ON MAY 25 WITH A SCRUBBER ID FAN BEARING FAILURE.

6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS NOT OPERATED THROUGH JUNE BECAUSE PARTS FOR THE SCRUBBER ID FAN HAD NOT ARRIVED AT THE PLANT. SCRUBBER SERVICE WAS NOT REQUIRED BECAUSE OF LOW BOILER LOAD.

SCRUBBER REPAIRS AT ST. CLAIR HAVE REQUIRED A GREAT DEAL OF OUTAGE TIME BECAUSE THE UTILITY DOES NOT STOCK A GREAT DEAL OF PARTS FOR THE SCRUBBER. THE ST CLAIR 6 SCRUBBER IS SCHEDULED TO BE PERMANENTLY REMOVED FROM SERVICE IN SEPTEMBER 1981 WHEN THE NEW 100% CAPACITY ESP FACILITY CURRENTLY UNDER CONSTRUCTION IS COMPLETE. AT PRESENT 50% OF THE FLUE GAS IS SCRUBBED AND 50% PASSES THROUGH THE ESP. DURING LOW LOAD PERIODS EITHER THE SCRUBBER OR ESP CAN BE SHUT DOWN.

7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM DID NOT OPERATE DURING THE JULY THROUGH SEPTEMBER PERIOD. THE UTILITY IS WAITING ON A UNIT OUTAGE TO PERFORM THE NECESSARY REPAIRS ON THE BOOSTER FAN AND TO REPAIR SOME MINOR SCRUBBER INTERNAL PROBLEMS.

10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOOSTER FAN WAS REPAIRED DURING THE OCTOBER THROUGH DECEMBER PERIOD. HOWEVER, THE RECIRCULATION TANK AGITATORS ARE UNAVAILABLE AND REQUIRE REPAIRS. THE UTILITY IS PRESENTLY DECIDING WHETHER THE SCRUBBING SYSTEM REPAIRS WILL BE MADE DURING THE NEXT SCHEDULED OUTAGE IN SEPTEMBER 1981 OR BE DECOMMISSIONED.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	MINNESOTA POWER & LIGHT	
PLANT NAME	CLAY BOSWELL	
UNIT NUMBER	3	
CITY	COHASSET	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	1720.	(4.000 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	350	
GROSS UNIT GENERATING CAPACITY - MW	364	
NET UNIT GENERATING CAPACITY W/FGD - MW	347	
NET UNIT GENERATING CAPACITY WO/FGD - MW	350	
EQUIVALENT SCRUBBED CAPACITY - MW	350	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	613.47	(1300000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	123.3	(254 F)
STACK HEIGHT - M	213.	(700 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.9	(26.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19538.	(8400 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		7500-9900
AVERAGE ASH CONTENT - %	9.00	
RANGE ASH CONTENT - %	4.81-16.0	
AVERAGE MOISTURE CONTENT - %	26.00	
RANGE MOISTURE CONTENT - %	24.0-28.0	
AVERAGE SULFUR CONTENT - %	.92	
RANGE SULFUR CONTENT - %	0.5-1.5	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	0.0-0.07	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	IMPINGEMENT TOWER	
SUPPLIER	KREBS ENGINEERS	
DIMENSIONS - FT	18 HIGH X 126 WIDE X 52 LONG	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	316L SS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	714.4	(11340 GPM)
L/G RATIO - LITER/CU.M	1.1	(8.3 GAL/1000ACF)
PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	2.4	(8.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	613.5	(1300000 ACFM)
INLET GAS TEMPERATURE - C	123.3	(254 F)
SO2 REMOVAL EFFICENCY - %	.0	

MINNESOTA POWER & LIGHT: CLAY BOSWELL 3 (CONT.)

PARTICLE REMOVAL EFFICIENCY - % 98.7

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/73	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN MAY 1973 SCALING AND PLUGGING HAVE OCCURRED IN NOZZLES, NOZZLE TREES, STRAINERS, ON PUNCH PLATE BAFFLES, IN THE WET/DRY ZONE, AND ON THE FAN AND THE MIST ELIMINATOR. PLUGGING HAS ALSO RESULTED AS DEPOSITS HAVE FALLEN INTO THE DRAINS AT THE BOTTOM OF THE SCRUBBER. DUE TO THE CALCIUM-RICH ASH, CHARACTERISTIC OF THE WESTERN COAL BURNED, THE SCALING IS AGGRAVATED. THE UTILITY HAS CONTROLLED SCALE BY BLOWDOWN OF THE SCRUBBING SYSTEM. THIS HAS MAINTAINED THE PROCESS CHEMISTRY BELOW SATURATION WITH RESPECT TO CALCIUM SULFITE. A VERY HIGH LEVEL OF MAINTENANCE HAS BEEN MAINTAINED ALSO TO MINIMIZE SCALE ACCUMULATION AND PLUGGING, THIS HAS INCLUDED WASHING OF THE WET FAN WHICH HAS RESULTED IN A STACK MIST PROBLEM. THE USE OF SOOT BLOWERS IN PLACE OF WASHING WAS ATTEMPTED BUT WAS UNSUCCESSFUL. THE UTILITY HAS REDUCED THE AMOUNT OF WASHING AND HAS CONSIDERED THE INSTALLATION OF REHEAT OR CONSTRUCTION OF A NEW LOW-VELOCITY STACK.

10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.

1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SCRUBBER EXPERIENCED NO PROBLEMS DURING THE 1ST QUARTER OF 1980.

4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO SCRUBBER-RELATED OUTAGES OCCURRED DURING THE SECOND QUARTER OF 1980. DOWN TIME FOR MAINTENANCE WAS NOT REQUIRED SINCE GENERAL MAINTENANCE CAN BE PERFORMED ON THE MINNESOTA POWER AND LIGHT PARTICLE SCRUBBERS WHILE THEY ARE IN SERVICE.

7/80	SYSTEM		100.0	100.0	90.3			720	650	650	60.2
8/80	SYSTEM		100.0	100.0	78.0			744	580	580	52.3
9/80	SYSTEM		100.0	100.0	84.0			744	625	625	54.8

MINNESOTA POWER & LIGHT: CLAY BOSWELL 3 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

NO OPERATIONAL PROBLEMS WERE REPORTED FOR THE JULY THROUGH SEPTEMBER PERIOD.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM	100.0	100.0	100.0	85.9			744	639	639	62.3
11/80	SYSTEM	100.0	100.0	100.0	81.5			720	587	587	64.6
12/80	SYSTEM	100.0	100.0	100.0	81.6			744	607	607	60.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO SCRUBBER PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER 1980.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

```
COMPANY NAME                                   MINNESOTA POWER & LIGHT
PLANT NAME                                     SYL LASKIN
UNIT NUMBER                                    1
CITY                                           AURORA
STATE                                          MINNESOTA
REGULATORY CLASSIFICATION                      E
PARTICULATE EMISSION LIMITATION - NG/J          258.        (  .600 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                 1720.        ( 4.000 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                 ******       (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              116
GROSS UNIT GENERATING CAPACITY - MW              62
NET UNIT GENERATING CAPACITY W/FGD - MW          57
NET UNIT GENERATING CAPACITY WO/FGD - MW         58
EQUIVALENT SCRUBBED CAPACITY - MW                58

 ** UNIT DATA - BOILER AND STACK
    BOILER SUPPLIER                            COMBUSTION ENGINEERING
    BOILER TYPE                                PULVERIZED COAL
    BOILER SERVICE LOAD                        INTERMEDIATE
    DESIGN BOILER FLUE GAS FLOW - CU.M/S        141.57      ( 300000 ACFM)
    BOILER FLUE GAS TEMPERATURE - C             171.1       ( 340 F)
    STACK HEIGHT - M                             91.        ( 300 FT)
    STACK SHELL                                CONCRETE
    STACK TOP DIAMETER - M                        3.2       ( 10.5 FT)

 ** FUEL DATA
    FUEL TYPE                                  COAL
    FUEL GRADE                                 SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                 20469.       (  8800 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                              7509-9923
    AVERAGE ASH CONTENT - %                       9.00
    RANGE ASH CONTENT - %                      4.81-16.0
    AVERAGE MOISTURE CONTENT - %                 26.70
    RANGE MOISTURE CONTENT - %                 24.0-28.0
    AVERAGE SULFUR CONTENT - %                    1.00
    RANGE SULFUR CONTENT - %                   .5-1.5
    AVERAGE CHLORIDE CONTENT - %                   .01
    RANGE CHLORIDE CONTENT - %                 0.00-0.07

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
    NUMBER                                     0
    TYPE                                       NONE

 ** FABRIC FILTER
    NUMBER                                     0
    TYPE                                       NONE

 ** ESP
    NUMBER                                     0
    TYPE                                       NONE

 ** PARTICLE SCRUBBER
    NUMBER                                     1
    GENERIC TYPE                               IMPINGEMENT TOWER
    SUPPLIER                                   KREBS ENGINEERS
    DIMENSIONS - FT                            34 WIDE X 18 HIGH X 23 LONG
    SHELL GENERIC MATERIAL                     STAINLESS STEEL
    SHELL SPECIFIC MATERIAL                    AUSTENITIC
    LINER GENERIC MATERIAL                     NONE
    LINER SPECIFIC MATERIAL                    N/A
    GAS CONTACTING DEVICE TYPE                 316 ELC SS
    NUMBER OF CONTACTING ZONES                 1
    LIQUID RECIRCULATION RATE - LITER/S         151.2       ( 2400 GPM)
    L/G RATIO - LITER/CU.M                        1.1       ( 8.3 GAL/1000ACF)
    PRESSURE DROP - KPA                            .6       ( 2.5 IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                2.1       (    7.0 FT/S)
    INLET GAS FLOW RATE - CU.M/S                137.4       ( 291160 ACFM)
```

MINNESOTA POWER & LIGHT: SYL LASKIN 1 (CONT.)

INLET GAS TEMPERATURE - C	171.1	(340 F)
SO2 REMOVAL EFFICENCY - %	.0	
PARTICLE REMOVAL EFFICIENCY - %	97.8	

-----PERFORMANCE DATA-----

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/71	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN JUNE 1971 SCALING AND PLUGGING HAVE OCCURRED IN NOZZLES, NOZZLE TREES, STRAINERS, ON PUNCH PLATE BAFFLES, IN THE WET/DRY ZONE, AND ON THE FAN AND THE MIST ELIMINATOR. PLUGGING HAS ALSO RESULTED AS DEPOSITS HAVE FALLEN INTO THE DRAINS AT THE BOTTOM OF THE SCRUBBER. DUE TO THE CALCIUM-RICH ASH, CHARACTERISTIC OF THE WESTERN COAL BURNED, THE SCALING IS AGGRAVATED. THE UTILITY HAS CONTROLLED SCALE BY BLOWDOWN OF THE SCRUBBING SYSTEM. THIS HAS MAINTAINED THE PROCESS CHEMISTRY BELOW SATURATION WITH RESPECT TO CALCIUM SULFITE. A VERY HIGH LEVEL OF MAINTENANCE HAS BEEN MAINTAINED ALSO TO MINIMIZE SCALE ACCUMULATION AND PLUGGING, THIS HAS INCLUDED WASHING OF THE WET FAN WHICH HAS RESULTED IN A STACK MIST PROBLEM. THE USE OF SOOT BLOWERS IN PLACE OF WASHING WAS ATTEMPTED BUT WAS UNSUCCESSFUL. THE UTILITY HAS REDUCED THE AMOUNT OF WASHING AND HAS CONSIDERED THE INSTALLATION OF REHEAT OR CONSTRUCTION OF A NEW LOW-VELOCITY STACK.

THE PROBLEMS AT SYL LASKIN ARE NOT AS SEVERE AS THE PROBLEMS AT CLAY BOSWELL DUE TO THE FACT THAT THE RECYCLE LOOP IS NOT CLOSED TO THE SAME EXTENT. THE MIST CARRYOVER PROBLEM IS LESS SEVERE OWING TO OPERATION OF THE UNIT AT PARTIAL LOAD RESULTING IN A LOWER STACK VELOCITY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SCRUBBER EXPERIENCED NO PROBLEMS DURING THE 1ST QUARTER OF 1980.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO SCRUBBER-RELATED OUTAGES OCCURRED DURING THE SECOND QUARTER OF 1980. DOWN TIME FOR MAINTENANCE WAS NOT REQUIRED SINCE GENERAL MAINTENANCE CAN BE PERFORMED ON THE MINNESOTA POWER AND LIGHT PARTICLE SCRUBBERS WHILE THEY ARE IN SERVICE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	SYSTEM	100.0	100.0	100.0	56.6			744	421	421	25.2
8/80	SYSTEM	100.0	100.0	100.0	19.0			744	140	140	12.0

MINNESOTA POWER & LIGHT: SYL LASKIN 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO BOILER OR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JULY AND AUGUST. LOW UTILIZATION FACTORS WERE DUE TO A LACK OF POWER DEMAND.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/80	SYSTEM	100.0	100.0	100.0	4.4			720	33	33	1.9

** PROBLEMS/SOLUTIONS/COMMENTS

NO SCRUBBER OUTAGES OCCURRED DURING SEPTEMBER. THE LOW UTILIZATION FACTOR WAS AGAIN THE RESULT OF A LACK OF DEMAND FOR POWER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM	100.0			.0			744	0	744	.0
11/80	SYSTEM	100.0	100.0	100.0	24.3			720	175	175	10.2
12/80	SYSTEM	100.0	100.0	100.0	64.1			744	477	477	23.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO SCRUBBER-RELATED PROBLEMS OCCURRED DURING THE FOURTH QUARTER 1980. LOW UTILIZATION FACTORS WERE CAUSED BY A LACK OF POWER DEMAND.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	MINNESOTA POWER & LIGHT	
PLANT NAME	SYL LASKIN	
UNIT NUMBER	2	
CITY	AURORA	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	1720.	(4.000 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	116	
GROSS UNIT GENERATING CAPACITY - MW	62	
NET UNIT GENERATING CAPACITY W/FGD - MW	57	
NET UNIT GENERATING CAPACITY WO/FGD - MW	58	
EQUIVALENT SCRUBBED CAPACITY - MW	58	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	INTERMEDIATE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	141.57	(300000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	171.1	(340 F)
STACK HEIGHT - M	91.	(300 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.2	(10.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20469.	(8800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		7509-9923
AVERAGE ASH CONTENT - %	9.00	
RANGE ASH CONTENT - %	4.81-16.0	
AVERAGE MOISTURE CONTENT - %	26.70	
RANGE MOISTURE CONTENT - %	24.0-28.0	
AVERAGE SULFUR CONTENT - %	1.00	
RANGE SULFUR CONTENT - %	.5-1.5	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	0.00-0.07	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	IMPINGEMENT TOWER	
SUPPLIER	KREBS ENGINEERS	
DIMENSIONS - FT	34 WIDE X 18 HIGH X 23 LONG	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	316 ELC SS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	151.2	(2400 GPM)
L/G RATIO - LITER/CU.M	1.1	(8.3 GAL/1000ACF)
PRESSURE DROP - KPA	.6	(2.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	2.1	(7.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	137.4	(291160 ACFM)

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MINNESOTA POWER & LIGHT: SYL LASKIN 2 (CONT.)

     INLET GAS TEMPERATURE - C                    171.1        (  340 F)
     SO2 REMOVAL EFFICENCY - %                       .0
     PARTICLE REMOVAL EFFICIENCY - %               97.8


-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 6/71  SYSTEM

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         SINCE STARTUP IN JUNE 1971 SCALING AND PLUGGING HAVE OCCURRED IN NOZZLES,
                         NOZZLE TREES, STRAINERS, ON PUNCH PLATE BAFFLES, IN THE WET/DRY ZONE AND
                         ON THE FAN AND THE MIST ELIMINATOR.  PLUGGING HAS ALSO RESULTED AS DEPOSITS
                         HAVE FALLEN INTO THE DRAINS AT THE BOTTOM OF THE SCRUBBER.  DUE TO THE
                         CALCIUM-RICH ASH, CHARACTERISTIC OF THE WESTERN COAL BURNED, THE SCALING
                         IS AGGRAVATED.  THE UTILITY HAS CONTROLLED SCALE BY BLOWDOWN OF THE
                         SCRUBBING SYSTEM.  THIS HAS MAINTAINED THE PROCESS CHEMISTRY BELOW SATURA-
                         TION WITH RESPECT TO CALCIUM SULFITE.  A VERY HIGH LEVEL OF MAINTENANCE
                         HAS BEEN MAINTAINED ALSO TO MINIMIZE SCALE ACCUMULATION AND PLUGGING, THIS
                         HAS INCLUDED WASHING OF THE WET FAN WHICH HAS RESULTED IN A STACK MIST
                         PROBLEM.  THE USE OF SOOT BLOWERS IN PLACE OF WASHING WAS ATTEMPTED BUT
                         WAS UNSUCCESSFUL.  THE UTILITY HAS REDUCED THE AMOUNT OF WASHING AND HAS
                         CONSIDERED THE INSTALLATION OF REHEAT OR CONSTRUCTION OF A NEW LOW-VELOCITY
                         STACK.
                         THE PROBLEMS AT SYL LASKIN ARE NOT AS SEVERE AS THE PROBLEMS AT CLAY
                         BOSWELL DUE TO THE FACT THAT THE RECYCLE LOOP IS NOT CLOSED TO THE SAME
                         EXTENT.  THE MIST CARRYOVER PROBLEM IS LESS SEVERE OWING TO OPERATION
                         OF THE UNIT AT PARTIAL LOAD RESULTING IN A LOWER STACK VELOCITY.

10/79  SYSTEM                                                                 744

11/79  SYSTEM                                                                 720

12/79  SYSTEM                                                                 744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.

 1/80  SYSTEM                                                                 744

 2/80  SYSTEM                                                                 696

 3/80  SYSTEM                                                                 744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE UTILITY REPORTED THAT THE SCRUBBER EXPERIENCED NO PROBLEMS DURING THE
                         1ST QUARTER OF 1980.

 4/80  SYSTEM                                                                 720

 5/80  SYSTEM                                                                 744

 6/80  SYSTEM                                                                 720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE UTILITY REPORTED THAT NO SCRUBBER-RELATED OUTAGES OCCURRED DURING THE
                         SECOND QUARTER OF 1980.  DOWN TIME FOR MAINTENANCE WAS NOT REQUIRED SINCE
                         GENERAL MAINTENANCE CAN BE PERFORMED ON THE MINNESOTA POWER AND LIGHT PAR-
                         TICLE SCRUBBERS WHILE THEY ARE IN SERVICE.

 7/80  SYSTEM      100.0        100.0       100.0         24.5                744   182    182  12.3
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MINNESOTA POWER & LIGHT: SYL LASKIN 2 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER DID NOT OPERATE MOST OF JULY DUE TO A BOILER INSPECTION. NO PROBLEMS WERE ENCOUNTERED WITH THE FGD UNIT.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/80	SYSTEM	100.0	100.0	100.0	15.0			744	115	115	5.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER OPERATED ONLY 115 HOURS DURING AUGUST DUE TO A LACK OF DEMAND.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/80	SYSTEM	100.0	100.0	100.0	5.2			720	39	39	2.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORT THAT NO SCRUBBER OUTAGES OCCURRED DURING SEPTEMBER. THE LOW UTILIZATION FACTOR RESULTED FROM A LACK OF DEMAND FOR POWER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM	100.0	100.0	100.0	26.3			744	195	195	15.0
11/60	SYSTEM	100.0	100.0	100.0	76.0			720	547	547	37.2
12/80	SYSTEM	100.0	100.0	100.0	70.8			744	527	527	34.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO SCRUBBER-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	MONTANA-DAKOTA UTILITIES	
PLANT NAME	LEWIS & CLARK	
UNIT NUMBER	1	
CITY	SIDNEY	
STATE	MONTANA	
REGULATORY CLASSIFICATION	******	
PARTICULATE EMISSION LIMITATION - NG/J	86.	(.200 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	430.	(1.000 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	50	
GROSS UNIT GENERATING CAPACITY - MW	55	
NET UNIT GENERATING CAPACITY W/FGD - MW	50	
NET UNIT GENERATING CAPACITY WO/FGD - MW	52	
EQUIVALENT SCRUBBED CAPACITY - MW	55	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	153.37	(325000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	215.6	(420 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	NONE	
STACK TOP DIAMETER - M	4.4	(14.5 FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	15003.	(6450 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		6200-6700
AVERAGE ASH CONTENT - %	7.80	
RANGE ASH CONTENT - %	7.2-9.3	
AVERAGE MOISTURE CONTENT - %	36.20	
RANGE MOISTURE CONTENT - %	34.25-38.16	
AVERAGE SULFUR CONTENT - %	.61	
RANGE SULFUR CONTENT - %	.32-1.43	
AVERAGE CHLORIDE CONTENT - %	.03	
RANGE CHLORIDE CONTENT - %	******	

*** PARTICLE CONTROL

** MECHANICAL COLLECTOR

NUMBER	1	
TYPE	MULTICLONES	
SUPPLIER	WESTERN PRECIPITATION	
INLET FLUE GAS CAPACITY - CU.M/S	106.2	(225000 ACFM)
INLET FLUE GAS TEMPERATURE - C	176.7	(350 F)
PRESSURE DROP - KPA	.4	(1. IN-H2O)
PARTICLE REMOVAL EFFICENCY -%	85.7	

** PARTICLE SCRUBBER

GENERIC TYPE	VENTURI TOWER	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	10.5 DIA X 27	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
GAS CONTACTING DEVICE TYPE	CARBON STEEL WITH 1" NORTON CA-308	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	212.6	(3374 GPM)
L/G RATIO - LITER/CU.M	1.7	(13.0 GAL/1000ACF)
PRESSURE DROP - KPA	3.2	(13.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	148.0	(313730 ACFM)
INLET GAS TEMPERATURE - C	215.6	(420 F)

MONTANA-DAKOTA UTILITIES: LEWIS & CLARK 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING A SCHEDULED BOILER OUTAGE GENERAL SCRUBBER MAINTENANCE WAS PERFORMED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE SCRUBBER WAS TEMPORARILY BYPASSED TO ALLOW FOR REPAIRS NECESSITATED BY A LEAK IN THE FLOODED DISC SCRUBBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO SCRUBBER PROBLEMS OCCURRED DURING DECEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE JANUARY THROUGH MARCH PERIOD THE SCRUBBER WAS AVAILABLE MORE THAN 95% OF THE TIME.

THE EROSION PROBLEM MENTIONED DURING NOVEMBER CONTINUED. SECTIONS OF THE EXTERIOR CARBON STEEL LINED COLUMN WALL SUPPORTING THE FLOODED DISC WERE ERODING, FILLING THE INNER CHAMBER WITH SLURRY AND ULTIMATELY RENDERING THE DISC MOVEMENT MECHANISM INOPERATIVE. THE UTILITY HAS MANAGED TO KEEP THE SCRUBBER OPERATING AS A STOP-GAP MEASURE BETWEEN UNIT SHUTDOWNS BY INSERTING A GARDEN HOSE IN THE COLUMN HOLES AND CONTINUALLY FLUSHING THE INNER CHAMBER. THE UTILITY HAS HAD SOME SUCCESS IN OTHER EROSION AREAS BY MAKING REPAIRS WITH A HASTELLOY MATERIAL. PLANS ARE BEING MADE TO JACKET THE ENTIRE DISC SUPPORT COLUMN WITH HASTELLOY G.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUT DOWN FOR TWO WEEKS IN MAY.

CREWS INSPECTING THE SCRUBBING SYSTEM DISCOVERED THAT THE NINE FOOT SCRUBBER LINER SECTION AT THE BOTTOM OF THE CYCLONIC MIST ELIMINATOR WAS SEVERELY ERRODED. THE LINER HAS LASTED THREE YEARS. THE UTILITY CONSIDERS THIS A NORMAL MAINTENANCE PROBLEM. AT ONE TIME LINERS IN THIS SECTION WERE REPLACED EVERY SIX MONTHS. REPLACEMENT WORK ON THE LATEST FAILURE IS EXPECTED TO BEGIN BY JULY 21.

THE ENTIRE SCRUBBER COLUMN SUPPORTING THE DISC WHICH WAS ERODING AS REPORTED DURING THE PREVIOUS TWO QUARTERS HAS BEEN CLAD WITH HASTELLOY G.

THE UTILITY REPORTED THAT THE SCRUBBER HAS EXPERIENCED PLUGGING AT WET/DRY INTERFACES WITHIN THE STRUCTURE. IT APPEARS THAT THIS IS RELATED TO COAL

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

SULFUR CONTENT. WHEN THE SULFUR CONTENT IS RELATIVELY HIGH (0.7 TO 1.0% AT LEWIS AND CLARK) THE PLUGGING DOES NOT OCCUR. LIMESTONE IS ADDED AS REQUIRED TO PREVENT THE OCCURRANCE OF LOW PH LEVELS. WHEN THE SULFUR CONTENT FALLS TO THE 0.3% RANGE THE PH RISES AS A RESULT OF THE ALKALINE CONSTITUENTS IN THE FLY ASH UNTIL SOFT SCALE PLUGGING RESULTS. THE UTILITY HAS CONSIDERED ADDING ACID TO STABILIZE THE PH WHEN THE COAL SULFUR CONTENT DROPS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY TWO WEEKS OF DOWN TIME WAS NECESSARY TO REPLACE THE MIST ELIMINATOR LINER.

THE PROBLEM WITH THE FLOODED DISC BUILDUP MENTIONED EARLIER CONTINUED. THE UTILITY PERFORMS THE NECESSARY REPAIRS IN THREE TO FOUR HOURS WHEN THIS OCCURS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED WITH SCRUBBING OPERATIONS DURING THE MONTHS OF AUGUST AND SEPTEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE SCRUBBING OPERATIONS DURING THE OCTOBER THROUGH DECEMBER PERIOD.

SCRUBBING OPERATIONS WERE SHUTDOWN FOR ONE WEEK DURING THE LAST PART OF OCTOBER FOR A SCHEDULED MAINTENANCE OVERHAUL AND NO PROBLEMS WERE FOUND.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                     PACIFIC POWER & LIGHT
PLANT NAME                                       DAVE JOHNSTON
UNIT NUMBER                                      4
CITY                                             GLENROCK
STATE                                            WYOMING
REGULATORY CLASSIFICATION                        ******
PARTICULATE EMISSION LIMITATION - NG/J             90.        (  .210 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                    215.        (  .500 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                   ******       (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW               *****
GROSS UNIT GENERATING CAPACITY - MW                330
NET UNIT GENERATING CAPACITY W/FGD - MW            327
NET UNIT GENERATING CAPACITY WO/FGD - MW           330
EQUIVALENT SCRUBBED CAPACITY - MW                  330

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                             COMBUSTION ENGINEERING
     BOILER TYPE                                 PULVERIZED COAL
     BOILER SERVICE LOAD                         BASE
     DESIGN BOILER FLUE GAS FLOW - CU.M/S          707.85     (1500000 ACFM)
     BOILER FLUE GAS TEMPERATURE - C               132.2      ( 270 F)
     STACK HEIGHT - M                               76.       ( 250 FT)
     STACK SHELL                                 ******
     STACK TOP DIAMETER - M                      *******      (***** FT)

 ** FUEL DATA
     FUEL TYPE                                   COAL
     FUEL GRADE                                  SUBBITUMINOUS
     AVERAGE HEAT CONTENT - J/G                  17282.       (  7430 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                               5,000-9,000
     AVERAGE ASH CONTENT - %                        12.00
     RANGE ASH CONTENT - %                       ******
     AVERAGE MOISTURE CONTENT - %                   26.00
     RANGE MOISTURE CONTENT - %                  ******
     AVERAGE SULFUR CONTENT - %                       .50
     RANGE SULFUR CONTENT - %                    ******
     AVERAGE CHLORIDE CONTENT - %                     .04
     RANGE CHLORIDE CONTENT - %                  ******

*** PARTICLE CONTROL

 ** PARTICLE SCRUBBER
     NUMBER                                        3
     GENERIC TYPE                                VENTURI TOWER
     SPECIFIC TYPE                               VARIABLE-THROAT/TOP-ENTRY PLUMB BOB
     SUPPLIER                                    CHEMICO
     SHELL GENERIC MATERIAL                      CARBON STEEL
     SHELL SPECIFIC MATERIAL                     AISI 1110
     LINER GENERIC MATERIAL                      ORGANIC
     LINER SPECIFIC MATERIAL                     POLYESTER
     LIQUID RECIRCULATION RATE - LITER/S           409.5      ( 6500 GPM)
     L/G RATIO - LITER/CU.M                          1.7      (13.0 GAL/1000ACF)
     PRESSURE DROP - KPA                             3.7      (15.0 IN-H2O)
     INLET GAS FLOW RATE - CU.M/S                  327.5      ( 694000 ACFM)
     INLET GAS TEMPERATURE - C                     135.0      (  275 F)
     SO2 REMOVAL EFFICENCY - %                      40.0
     PARTICLE REMOVAL EFFICIENCY - %                99.7

----------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
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 4/72  SYSTEM
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PACIFIC POWER & LIGHT: DAVE JOHNSTON 4 (CONT.)

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-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                 SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         SINCE STARTUP IN APRIL 1972, THE SCRUBBING UNIT HAS EXPERIENCED A MAJOR
                         SCALING PROBLEM.  HARD GYPSUM SCALE ACCUMULATED IN THE SCRUBBER VESSELS
                         AND PIPING.  THE USE OF LIME FOR PH CONTROL AND LIGNO SULFONATE TO ALTER
                         THE HARDNESS OF DEPOSITS IMPROVED THE SCALE PROBLEM.  FRESH WATER WASHING
                         HAS BEEN REQUIRED TO FLUSH ASH AND SCALE DEPOSITS FROM THE SCRUBBER
                         VESSELS.
                         SOLIDS BUILDUP HAS OCCURRED AT THE WET-DRY INTERFACE AND IN THE BLEED AND
                         RECYCLE LINES.  THE UTILITY IS USING AN ADDITIVE (HEXAMATA PHOSPHATE) IN
                         WHICH THE EFFECTS HAVE YET TO BE DETERMINED.
                         ADDITIONAL OPERATING PROBLEMS EXPERIENCED SINCE STARTUP INCLUDE ERROSION
                         IN THE RECYCLE PUMP AND "SILTING" DURING SHUTDOWN.
                         THE UTILITY CHARACTERIZED THE AVAILABILITY AS BEING DEPENDENT ON THE
                         AMOUNT OF BLOWDOWN AND FRESH WATER IRRIGATION THAT ARE EMPLOYED.

10/79  SYSTEM                                                                  744

11/79  SYSTEM                                                                  720

12/79  SYSTEM                                                                  744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.

 1/80  SYSTEM                                                                  744

 2/80  SYSTEM                                                                  696

 3/80  SYSTEM                                                                  744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER OF 1980.

 4/80  SYSTEM                                                                  720

 5/80  SYSTEM                                                                  744

 6/80  SYSTEM                                                                  720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURRED DURING THE SECOND
                         QUARTER OF 1980.

 7/80  SYSTEM                                                                  744

 8/80  SYSTEM                                                                  744

 9/80  SYSTEM                                                                  720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         NO INFORMATION WAS AVAILABLE FOR THE THIRD QUARTER OF 1980.

10/80  SYSTEM                                                                  744

11/80  SYSTEM                                                                  720

12/80  SYSTEM                                                                  744
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PACIFIC POWER & LIGHT: DAVE JOHNSTON 4 (CONT.)

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-------------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE
                           SCRUBBING OPERATIONS DURING THE OCTOBER THROUGH DECEMBER PERIOD.
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SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                 POTOMAC ELECTRIC POWER
PLANT NAME                                   DICKERSON
UNIT NUMBER                                  1
CITY                                         DICKERSON
STATE                                        MARYLAND
REGULATORY CLASSIFICATION                    ******
PARTICULATE EMISSION LIMITATION - NG/J       ******        (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J               ******        (****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J               ******        (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW            1348
GROSS UNIT GENERATING CAPACITY - MW            190
NET UNIT GENERATING CAPACITY W/FGD - MW        183
NET UNIT GENERATING CAPACITY WO/FGD - MW     *****
EQUIVALENT SCRUBBED CAPACITY - MW              190

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                         COMBUSTION ENGINEERING
     BOILER TYPE                             PULVERIZED COAL
     BOILER SERVICE LOAD                     ******
     DESIGN BOILER FLUE GAS FLOW - CU.M/S    ********      (******* ACFM)
     BOILER FLUE GAS TEMPERATURE - C         *******       (**** F)
     STACK HEIGHT - M                          213.        ( 700 FT)
     STACK SHELL                             CONCRETE
     STACK TOP DIAMETER - M                  *******       (***** FT)

 ** FUEL DATA
     FUEL TYPE                               COAL
     FUEL GRADE                              ******
     AVERAGE HEAT CONTENT - J/G              27214.        ( 11700 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                            ******
     AVERAGE ASH CONTENT - %                    14.00
     RANGE ASH CONTENT - %                   ******
     AVERAGE MOISTURE CONTENT - %            ********
     RANGE MOISTURE CONTENT - %              6-7
     AVERAGE SULFUR CONTENT - %                  2.00
     RANGE SULFUR CONTENT - %                ******
     AVERAGE CHLORIDE CONTENT - %            ********
     RANGE CHLORIDE CONTENT - %              ******

*** PARTICLE CONTROL

 ** ESP
     TYPE                                    COLD SIDE

 ** PARTICLE SCRUBBER
     GENERIC TYPE                            VENTURI TOWER
     SPECIFIC TYPE                           VARIABLE-THROAT/TOP-ENTRY PLUMB BOB
     SHELL GENERIC MATERIAL                  CARBON STEEL
     SHELL SPECIFIC MATERIAL                 AISI 1110
     NUMBER OF CONTACTING ZONES               2


-------------------------------------PERFORMANCE DATA-------------------------------------------------
PERIOC MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

10/79  SYSTEM                 100.0                    83.6                 744   622    622

11/79  SYSTEM                  96.0                    80.1                 720   601    577

12/79  SYSTEM                 100.0                    87.4                 744   650    650

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         DURING THIS PERIOD ONLY ONE SCRUBBER RELATED OUTAGE OCCURRED.  THE OUTAGE
                         WAS FOR AN ID FAN INSPECTION WHICH LASTED ONE DAY.

 1/80  SYSTEM     100.0       100.0                   100.0                 744   744    744
```

POTOMAC ELECTRIC POWER: DICKERSON 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/80	SYSTEM	94.3	95.8		94.3			696	685	656	
3/80	SYSTEM	100.0	100.0		100.0			744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER OF 1980 ONLY ONE SCRUBBER OUTAGE OCCURRED. IN FEBRUARY OUTAGE TIME WAS NECESSARY TO REPAIR A SLURRY RECYCLE LINE LEAK.

4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DICKERSON 1 SCRUBBER DEPENDABILITY FACTORS WERE UNAVAILABLE FOR THE APRIL-JUNE PERIOD. THESE FIGURES SHOULD BE AVAILABLE BY THE THIRD QUARTER REPORT. THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED THE ENTIRE SECOND QUARTER WITH ESSENTIALLY 100% AVAILABILITY. NO SCRUBBER-RELATED PROBLEMS WERE REPORTED.

7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS NOT FIGURED OUT THE DEPENDABILITY FIGURES AS YET.

THE UTILITY REPORTED HAVING MINIMAL SCRUBBING SYSTEM PROBLEMS DURING THE JULY-SEPTEMBER PERIOD.

THE BOILER CAPACITY WAS REDUCED DURING PART OF THE PERIOD DUE TO A LINING FAILURE IN THE SCRUBBING SYSTEM PIPING.

10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE OCTOBER THROUGH DECEMBER PERIOD THE BOILER WAS OPERATED AT A 60% (110 MW) CAPACITY DUE TO A LINING FAILURE IN THE SCRUBBING SYSTEM PIPING.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	POTOMAC ELECTRIC POWER	
PLANT NAME	DICKERSON	
UNIT NUMBER	2	
CITY	DICKERSON	
STATE	MARYLAND	
REGULATORY CLASSIFICATION	******	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1348	
GROSS UNIT GENERATING CAPACITY - MW	190	
NET UNIT GENERATING CAPACITY W/FGD - MW	183	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	190	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	******	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	213.	(700 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*******	(***** FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	27214.	(11700 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	14.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	6-7	
AVERAGE SULFUR CONTENT - %	2.00	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	

*** PARTICLE CONTROL

** ESP

TYPE	COLD SIDE

** PARTICLE SCRUBBER

GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
NUMBER OF CONTACTING ZONES	2

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM		100.0		97.0			744	722	722	
11/79	SYSTEM		96.4		88.9			720	664	640	
12/79	SYSTEM		100.0		100.0			744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

A ONE DAY OUTAGE OCCURRED, DUE TO A FAN LINING PROBLEM. NO OTHER SCRUBBER UNIT PROBLEMS WERE ENCOUNTERED DURING THE PERIOD.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM	95.4	96.4		95.4			744	736	710	

POTOMAC ELECTRIC POWER: DICKERSON 2 (CONT.)

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-------------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          IN JANUARY THE SCRUBBER WAS DOWN FOR THREE HOURS TO REPAIR A SLURRY
                          RECYCLE LINE LEAK.

                          31 HOURS OF THE OUTAGE TIME IN JANUARY WAS NECESSARY TO REPAIR A RECYCLE
                          PUMP.

 2/80  SYSTEM     100.0        100.0                   100.0                   696   696    696

 3/80  SYSTEM      96.9         96.9                    96.9                   744   744    721

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          IN MARCH THE SCRUBBER WAS DOWN FOR A SCRUBBER LINING WARRANTY INSPECTION.
                          NO REPAIR WORK WAS NECESSARY.

 4/80  SYSTEM                                                                  720

 5/80  SYSTEM                                                                  744

 6/80  SYSTEM                                                                  720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          DICKERSON 2 SCRUBBER DEPENDABILITY FACTORS WERE UNAVAILABLE FOR THE APRIL-
                          JUNE PERIOD.  THESE FIGURES SHOULD BE AVAILABLE BY THE THIRD QUARTER
                          REPORT.  THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED THE ENTIRE
                          SECOND QUARTER WITH ESSENTIALLY 100% AVAILABILITY.  NO SCRUBBER-RELATED
                          PROBLEMS WERE REPORTED.

 7/80  SYSTEM                                                                  744

 8/80  SYSTEM                                                                  744

 9/80  SYSTEM                                                                  720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          THE UTILITY HAS NOT FIGURED OUT THE DEPENDABILITY FIGURES AS YET.

                          THE UTILITY REPORTED HAVING MINIMAL SCRUBBING SYSTEM PROBLEMS DURING THE
                          JULY-SEPTEMBER PERIOD.

                          THE BOILER CAPACITY WAS REDUCED DURING PART OF THE PERIOD DUE TO A LINING
                          FAILURE IN THE SCRUBBING SYSTEM PIPING.

10/80  SYSTEM                                                                  744

11/80  SYSTEM                                                                  720

12/80  SYSTEM                                                                  744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          DURING THE OCTOBER THROUGH DECEMBER PERIOD THE BOILER WAS OPERATED AT A
                          60% (110 MW) CAPACITY DUE TO A LINING FAILURE IN THE SCRUBBING SYSTEM
                          PIPING.
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SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                      POTOMAC ELECTRIC POWER
PLANT NAME                                        DICKERSON
UNIT NUMBER                                       3
CITY                                              DICKERSON
STATE                                             MARYLAND
REGULATORY CLASSIFICATION                         ******
PARTICULATE EMISSION LIMITATION - NG/J            ******          (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                      688.          ( 1.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                    ******          (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                  548
GROSS UNIT GENERATING CAPACITY - MW                 190
NET UNIT GENERATING CAPACITY W/FGD - MW             178
NET UNIT GENERATING CAPACITY WO/FGD - MW            182
EQUIVALENT SCRUBBED CAPACITY - MW                    95

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                              COMBUSTION ENGINEERING
     BOILER TYPE                                  PULVERIZED COAL
     BOILER SERVICE LOAD                          BASE
     DESIGN BOILER FLUE GAS FLOW - CU.M/S           278.42        ( 590000 ACFM)
     BOILER FLUE GAS TEMPERATURE - C                126.1         ( 259 F)
     STACK HEIGHT - M                               213.          ( 700 FT)
     STACK SHELL                                  CONCRETE
     STACK TOP DIAMETER - M                       *******         (***** FT)

 ** FUEL DATA
     FUEL TYPE                                    COAL
     FUEL GRADE                                   BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                   27214.          ( 11700 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                   ******
     AVERAGE ASH CONTENT - %                         14.00
     RANGE ASH CONTENT - %                        ******
     AVERAGE MOISTURE CONTENT - %                 ********
     RANGE MOISTURE CONTENT - %                   6-7
     AVERAGE SULFUR CONTENT - %                       2.00
     RANGE SULFUR CONTENT - %                     ******
     AVERAGE CHLORIDE CONTENT - %                 ********
     RANGE CHLORIDE CONTENT - %                   ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
     NUMBER                                       0
     TYPE                                         NONE

 ** FABRIC FILTER
     NUMBER                                       0
     TYPE                                         NONE

 ** PARTICLE SCRUBBER
     NUMBER                                        1
     GENERIC TYPE                                 VENTURI TOWER
     SPECIFIC TYPE                                VARIABLE-THROAT/TOP-ENTRY PLUMB BOB
     SUPPLIER                                     CHEMICO
     SHELL GENERIC MATERIAL                       CARBON STEEL
     SHELL SPECIFIC MATERIAL                      AISI 1110
     LINER SPECIFIC MATERIAL                      FIBER-REINFORCED POLYESTER
     L/G RATIO - LITER/CU.M                          2.7          (20.0 GAL/1000ACF)
     PRESSURE DROP - KPA                             2.7          (11.0 IN-H2O)
     INLET GAS FLOW RATE - CU.M/S                  139.2          ( 295000 ACFM)
     INLET GAS TEMPERATURE - C                     126.1          (  259 F)
     PARTICLE REMOVAL EFFICIENCY - %                99.0
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PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/73	SYSTEM							720			
10/73	SYSTEM							744			
11/73	SYSTEM							720			
12/73	SYSTEM							744			
1/74	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS DURING THIS PERIOD RANGED FROM CORROSION LEAKS IN EXPANSION JOINTS TO PROBLEMS IN MATERIAL HANDLING EQUIPMENT, FEEDING AND SLAKING OF MGO, PLUGGING IN THE MGO MIX TANK AND SUCTION LINES TO THE MGO MAKE-UP PUMPS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/74	SYSTEM							672			
3/74	SYSTEM							744			
4/74	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

MAINTENANCE AND MODIFICATIONS WERE PERFORMED ON THE SYSTEM. THE MAJOR SYSTEM REVISION MADE DURING THIS PERIOD WAS THE ADDITION OF A PRE-MIX TANK IN THE MGO SYSTEM.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/74	SYSTEM							720			
5/74	SYSTEM							744			
6/74	SYSTEM							720			
7/74	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

LIMITED OPERATION OCCURRED BECAUSE THE UTILITY DID NOT HAVE ACCESS TO THE EPA CALCINING FACILITY AT THE ESSEX CHEMICAL COMPANY SULFURIC ACID PLANT. BY THE END OF JUNE 1974, ALL THE MGO AT DICKERSON HAD BEEN USED AND A SILO PLUS THREE CARS WERE FULL OF MGSO3.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/74	SYSTEM							744		87	
9/74	SYSTEM							720			
10/74	SYSTEM							744			
11/74	SYSTEM							720			
12/74	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THIS PERIOD THE SYSTEM GENERALLY OPERATED AT 75 PERCENT OF THE DESIGN GAS FLOW.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/75	SYSTEM							744			

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS DEVELOPED IN THE BUCKET ELEVATOR TRANSPORTING THE MGSO3 FROM THE DRYER TO THE STORAGE SILO.

2/75	SYSTEM							672			
3/75	SYSTEM							744			
4/75	SYSTEM							720			
5/75	SYSTEM							744			
6/75	SYSTEM							720			
7/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT NO. 3 WAS TAKEN OUT OF SERVICE FOR AN 8 TO 12 WEEK TURBINE OVERHAUL. THE SCRUBBER WAS INSPECTED, MAINTENANCE AND MODIFICATIONS WERE MADE.

8/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM CONSISTS OF A SINGLE, TWO-STAGE SCRUBBER/ABSORBER, WHICH INCORPORATES AN ADJUSTABLE-THROAT VENTURI SCRUBBER FOR PARTICULATE REMOVAL AND A SECOND STAGE ABSORBER WITH A FIXED VENTURI TO REMOVE SO2. THE LIQUOR STREAMS FOR BOTH STAGES ARE SEPARATE AND OPERATE IN A CLOSED-LOOP MODE. UNTIL MID-1975 THE MAGNESIUM SULFITE GENERATED WAS TRANSFERRED TO AN EPA FINANCED FACILITY AT THE ESSEX CHEMICAL COMPANY SULFURIC ACID MANUFACTURING PLANT IN RUMFORD, RHODE ISLAND WHERE MAGNESIUM OXIDE WAS REGENERATED AND SO2 FROM THE REGENERATION PROCESS WAS CONVERTED TO SULFURIC ACID. THE RUMFORD FACILITY HAS SINCE BEEN CLOSED DOWN.

CONSTRUCTION WAS COMPLETED IN AUGUST AND THE SYSTEM STARTED UP IN SEPTEMBER 1973. DURING INTERMITTENT OPERATIONS FOR SHAKEDOWN THROUGH JANUARY 1974, THE SYSTEM'S LONGEST CONTINUOUS RUN WAS 271 HOURS. THE SYSTEM HAS RE-STARTED FROM JULY THROUGH DECEMBER 1974, AND AGAIN ON AUGUST 11, 1975, FOR APPROXIMATELY 87 HOURS.

FGD UNIT OUTAGES WERE CAUSED PRIMARILY BY PIPE AND PUMP CORROSION AND MAJOR TURBINE OVERHAUL OF THE BOILER. PARTICULATE AND SO2 REMOVAL EFFICIENCY GUARANTEES WERE CORROBORATED DURING OPERATIONAL PHASES.

THE FGD SYSTEM WAS RESTARTED IN AUGUST. STEAM WAS LOST TO THE MGO MIX TANK, RESULTING IN A VERY MOIST PRODUCT FROM THE CENTRIFUGE. CAKING IN THE DRYER OCCURRED. AT THIS POINT, THE UTILITY DECIDED TO TEST ONLY THE FIRST-STAGE OF THE SCRUBBING SYSTEM, TAKING GAS AHEAD OF THE PRECIPITATOR. FGD OPERATION AT DICKERSON TERMINATED AT THIS POINT.

THE REMAINING SUPPLY OF MAGNESIUM OXIDE, ABOUT 100 TONS (10 DAYS), HAS BEEN DEPLETED, AND THE DICKERSON UNIT HAS BEEN TERMINATED AS A FGD SYSTEM.

9/75	SYSTEM							720			
10/75	SYSTEM							744			
11/75	SYSTEM							720			
12/75	SYSTEM							744			
1/76	SYSTEM							744			

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/76	SYSTEM							696			
3/76	SYSTEM							744			
4/76	SYSTEM							720			
5/76	SYSTEM							744			
6/76	SYSTEM							720			
7/76	SYSTEM							744			
8/76	SYSTEM							744			
9/76	SYSTEM							720			
10/76	SYSTEM							744			
11/76	SYSTEM							720			
12/76	SYSTEM							744			
1/77	SYSTEM							744			
2/77	SYSTEM							672			
3/77	SYSTEM							744			
4/77	SYSTEM							720			
5/77	SYSTEM							744			
6/77	SYSTEM							720			
7/77	SYSTEM							744			
8/77	SYSTEM							744			
9/77	SYSTEM							720			
10/77	SYSTEM							744			
11/77	SYSTEM							720			
12/77	SYSTEM							744			
1/78	SYSTEM							744			
2/78	SYSTEM	38.0	38.0		38.0			672	672	252	

** PROBLEMS/SOLUTIONS/COMMENTS

THERE HAVE BEEN MANY MAINTENANCE PROBLEMS AND PROBLEMS WITH LINER FAILURES. SINCE SHIFTING FROM SO2 TO PARTICULATE SCRUBBING ONLY, PLUGGING PROBLEMS HAVE NOT OCCURRED. LOW PH HAS CAUSED CORROSION WHICH WAS AGGRAVATED BY PARTICULATE ERROSION. THE UTILITY WILL PROBABLY RELINE WITH A FLAKE GLASS TYPE LINER. NO CHEMICALS (E.G. LIME) ARE ADDED TO THE CIRCULATING LIQUOR FOR PH BALANCE.

OUTAGE TIME WAS CAUSED BY LEAK REPAIRS IN SLURRY PIPING.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/78	SYSTEM	21.0	22.0		21.0			744	717	156	

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

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------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          OUTAGE TIME WAS DUE TO RUBBER LINING FAILURE IN THE RECYCLE PUMP DISCHARGE
                          LINE.

 4/78  SYSTEM     80.7        79.8                    76.4                     720   689    550

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          26 HOURS OF OUTAGE TIME WERE DUE TO SMALL LEAKS IN PIPING.

 5/78  SYSTEM     84.5        82.7                    74.0                     744   666    551

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          A LEAK OCCURRED IN A MIST ELIMINATOR DRAIN.

                          THERE WAS A LEAK IN A BLEED LINE FOR THE SCRUBBER RECYCLE CIRCUIT.

                          OUTAGE TIME WAS REQUIRED FOR BLEED LINE REPLACEMENT.

 6/78  SYSTEM    100.0        90.1                    68.7                     720   549    495

 7/78  SYSTEM    100.0          .0                      .0                     744    16      0

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          THE VENTURI SCRUBBER HAD AN AVAILABILITY OF 100% FOR JUNE AND JULY.  THE
                          ONLY VENTURI OUTAGE TIME WAS IN JUNE.  THE OUTAGE TIME WAS REQUIRED TO
                          TIE IN EQUIPMENT COMMON TO THE NEW UNIT AND UNIT 3.

                          THE BOILER WAS DOWN IN JULY FOR AN OVERHAUL.

                          THE REASON VENTURI HOURS CAN BE LOWER THAN BOILER HOURS WHEN THE VENTURI
                          HAS A 100% AVAILABILITY IS BECAUSE THE VENTURI IS NOT OPERATED UNDER LOW
                          LOAD CONDITIONS.

 8/78  SYSTEM                                                                  744

 9/78  SYSTEM                                                                  720

10/78  SYSTEM                                                                  744

11/78  SYSTEM                                                                  720

12/78  SYSTEM                                                                  744

 1/79  SYSTEM                                                                  744

 2/79  SYSTEM                                                                  672

 3/79  SYSTEM                                                                  744

 4/79  SYSTEM                                                                  720

 5/79  SYSTEM                                                                  744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          SCRUBBER OUTAGE HOURS SINCE SEPTEMBER 1978 (I.E. SEPTEMBER 1978 THROUGH
                          MAY 30, 1979) TOTAL 140.  THE UTILITY INDICATED THAT IT IS NO LONGER ALLOW-
                          ABLE TO BYPASS THE SCRUBBER WHEN PROBLEMS OCCUR, CLEANING THE PARTICULATE
                          MATTER SOLELY WITH THE ESP.  THE UTILITY MUST DROP THE BOILER LOAD SO THE
```

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)

PERFORMANCE DATA

UNIT REMAINS IN COMPLIANCE.
THERE HAVE BEEN NO PROBLEMS REPORTED FOR THE LAST FEW MONTHS. THE UTILITY IS KEEPING AHEAD OF PROBLEMS WITH A CONSCIENTIOUS INSPECTION AND MAINTENANCE PROGRAM.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
10/79	SYSTEM		98.6		95.4			744	720	710	

** PROBLEMS/SOLUTIONS/COMMENTS

A TEN HOUR OUTAGE OCCURRED FOR REPAIRS OF A LEAD LINE LEAK.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	SYSTEM		95.2		88.8			720	672	640	

** PROBLEMS/SOLUTIONS/COMMENTS

IN NOVEMBER, 8 HOURS OUTAGE TIME WAS REQUIRED TO REPAIR A LEAK IN A RECYCLE LINE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/79	SYSTEM		96.1		93.5			744	724	696	

** PROBLEMS/SOLUTIONS/COMMENTS

AN OUTAGE FOR GENERAL INSPECTION TOOK PLACE DURING DECEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM	78.7	88.2		78.7			744	664	586	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE SCRUBBER WAS DOWN TO REPAIR THE FLAKEGLASS LINING.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/80	SYSTEM	100.0	100.0		100.0			696	696	696	
3/80	SYSTEM	100.0	100.0		100.0			744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY AND MARCH THE SCRUBBER OPERATED WITH NO MAJOR PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT 3 SCRUBBER EXPERIENCED SOME DOWN TIME DURING THE APRIL-JUNE PERIOD AS A RESULT OF THE CONTINUING DETERIORATION OF THE SCRUBBER FLAKEGLASS LINING. THE UTILITY REPORTED THAT MAINTENANCE CREWS ARE PATCHING OLD PATCHES. A STUDY WILL BEGIN IN LATE JULY TO ESTABLISH THE OPTIMUM LINER MATERIAL AND APPLICATION STRATEGY FOR THE UNIT 3 SCRUBBING SYSTEM.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			

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EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

POTOMAC ELECTRIC POWER: DICKERSON 3 (CONT.)


------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL  PER  BOILER  FGD   CAP.
                                                                 SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                             THE UTILITY HAS NOT FIGURED OUT THE DEPENDABILITY FIGURES AS YET.

                             THE UTILITY REPORTED HAVING MINIMAL SCRUBBING SYSTEM PROBLEMS DURING THE
                             JULY-SEPTEMBER PERIOD.

                             THE BOILER CAPACITY WAS REDUCED TO 1/2 LOAD DURING PART OF THE PERIOD DUE
                             TO THE NECESSARY PATCHING OF THE SCRUBBER LINING.  THE UTILITY IS PRESENTLY
                             STUDYING THE POSSIBILITY OF REPLACING THE FLAKEGLASS LINER WITH A RUBBER
                             LINER.

10/80  SYSTEM                                                                  744

11/80  SYSTEM                                                                  720

12/80  SYSTEM                                                                  744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                             DURING THE OCTOBER THROUGH DECEMBER PERIOD THE BOILER WAS OPERATED AT A
                             60% (110 MW) CAPACITY DUE TO A LINING FAILURE IN THE SCRUBBING SYSTEM
                             PIPING.

                             UNIT 3 WILL BE SHUTDOWN ON FEBRUARY 2, 1981 TO REPLACE THE FLAKEGLASS
                             LINING.
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SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                   PUBLIC SERVICE OF COLORADO
PLANT NAME                                     ARAPAHOE
UNIT NUMBER                                    4
CITY                                           DENVER
STATE                                          COLORADO
REGULATORY CLASSIFICATION                      ******
PARTICULATE EMISSION LIMITATION - NG/J           43.          (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                 ******         (****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                 ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW             *****
GROSS UNIT GENERATING CAPACITY - MW              112
NET UNIT GENERATING CAPACITY W/FGD - MW          109
NET UNIT GENERATING CAPACITY WO/FGD - MW       *****
EQUIVALENT SCRUBBED CAPACITY - MW                112

 ** UNIT DATA - BOILER AND STACK
    BOILER SUPPLIER                            ******
    BOILER TYPE                                PULVERIZED COAL
    BOILER SERVICE LOAD                        ******
    DESIGN BOILER FLUE GAS FLOW - CU.M/S         245.39       ( 520000 ACFM)
    BOILER FLUE GAS TEMPERATURE - C              148.9        ( 300 F)
    STACK HEIGHT - M                           ******         (**** FT)
    STACK SHELL                                ******
    STACK TOP DIAMETER - M                     *******        (***** FT)

 ** FUEL DATA
    FUEL TYPE                                  COAL
    FUEL GRADE                                 SUBBITUMINOUS
    AVERAGE HEAT CONTENT - J/G                 23725.         ( 10200 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                ******
    AVERAGE ASH CONTENT - %                        9.30
    RANGE ASH CONTENT - %                      ******
    AVERAGE MOISTURE CONTENT - %                  13.70
    RANGE MOISTURE CONTENT - %                 ******
    AVERAGE SULFUR CONTENT - %                      .95
    RANGE SULFUR CONTENT - %                   0.6-0.95
    AVERAGE CHLORIDE CONTENT - %                    .01
    RANGE CHLORIDE CONTENT - %                 ******

 ** FUEL DATA
    FUEL TYPE                                  COAL
    FUEL GRADE                                 BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                 23493.         ( 10100 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                ******
    AVERAGE ASH CONTENT - %                       12.50
    RANGE ASH CONTENT - %                      ******
    AVERAGE MOISTURE CONTENT - %                  11.20
    RANGE MOISTURE CONTENT - %                 ******
    AVERAGE SULFUR CONTENT - %                      .65
    RANGE SULFUR CONTENT - %                   ******
    AVERAGE CHLORIDE CONTENT - %                    .01
    RANGE CHLORIDE CONTENT - %                 ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
    NUMBER                                       1

 ** FABRIC FILTER
    NUMBER                                       0
    TYPE                                       NONE

 ** ESP
    NUMBER                                       1

 ** PARTICLE SCRUBBER
    NUMBER                                       1
    GENERIC TYPE                               PACKED TOWER
    SPECIFIC TYPE                              MOABILE BED PACKING
```

PUBLIC SERVICE OF COLORADO: ARAPAHOE 4 (CONT.)

SUPPLIER	AIR CORRECTION DIVISION, UOP	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	RUBBER	
GAS CONTACTING DEVICE TYPE	STAINLESS STEEL GRIDS, PLASTIC SPHERES	
NUMBER OF CONTACTING ZONES	3	
L/G RATIO - LITER/CU.M	7.5	(56.0 GAL/1000ACF)
PRESSURE DROP - KPA	3.0	(12.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.4	(11.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	245.4	(520000 ACFM)
INLET GAS TEMPERATURE - C	151.7	(305 F)
SO2 REMOVAL EFFICENCY - %	30.0	
PARTICLE REMOVAL EFFICIENCY - %	93.0	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/77	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN SEPTEMBER 1977 SCALING AND PLUGGING AT THE WET/DRY ZONE, ON THE FIRST STAGE GRIDS, AND IN THE REHEATERS HAVE BEEN THE MOST PROMINENT PROBLEM AREAS CHARACTERIZED BY THIS SYSTEM. VARIOUS CHEMICAL ADDITIVES HAVE BEEN TESTED FOR CONTROL OF SCALING, INCLUDING PHOSPHATED ESTERS, BUT WITHOUT SIGNIFICANT IMPROVEMENT. BLOWDOWN IS MAINTAINED AT A HIGH LEVEL TO CHECK THE BUILDUP OF SALTS BUT, OTHER THAN FOR TESTING PURPOSES, NO CHEMICAL CONTROL METHOD HAS BEEN USED TO CONTROL SCALE ACCUMULATION. OTHER OPERATING EXPERIENCES INCLUDE WEAR AND PERIODIC REPLACEMENT OF THE MOBILE BALLS, EROSION OF LINING AND CORROSIVE FAILURE OF REHEATERS. THE EROSION AND LINING FAILURE HAVE NOT BEEN A SERIOUS PROBLEM EXCEPT IN THE RECIRCULATING PUMPS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER REHEATER FAILURES OCCURRED.

LEAKAGE IN THE INLINE STEAM TUBES HAS BEEN ENCOUNTERED. CORROSION IS KNOWN TO OCCUR AFTER LEAKS ARE EXPERIENCED.

THE PRIMARY PROBLEM WITH THE SYSTEM IS THE INABILITY TO ISOLATE MODULES. IF A PROBLEM OCCURS NO MODULE MAINTENANCE CAN BE PERFORMED UNLESS THE UNIT LOAD IS CUT BACK OR THE UNIT IS SHUT DOWN.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULE ISOLATION PROBLEMS CONTINUED THROUGH THE FIRST QUARTER OF 1980. USE OF THE CARBON STEEL DAMPERS HAS BEEN ABANDONED. THE PROGRAM FOR REPLACING THE DAMPERS HAS BEEN SUSPENDED INDEFINITELY. THE UNIT IS SHUTDOWN WHEN MAJOR SCRUBBER PROBLEMS OCCUR.

REHEATER STEAM TUBE LEAKS ARE STILL CAUSING PROBLEMS. THE SIX STEAM COILS ON THIS IN-LINE REHEAT SYSTEM, TWO OF WHICH ARE 316SS AND FOUR OF WHICH ARE CARBON STEEL, ARE EXPERIENCING CORROSION PROBLEMS. A SOLUTION TO THE

PUBLIC SERVICE OF COLORADO: ARAPAHOE 4 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

PROBLEM HAS NOT YET BEEN DETERMINED.

IN FEBRUARY THE UTILITY REPLACED THE SCRUBBER BALLS AND GRIDS. THE OLD BALLS WERE REPLACED WITH THE NEW HOLLOW HARD PLASTIC-WALLED BALLS WITH NOTCHED SEAMS. THE GRIDS WERE ORIGINALLY 316L SS, CERAMIC, POLYPROPYLENE, AND RUBBER LINED CARBON STEEL, BUT HAVE BEEN REPLACED WITH 317L SS GRIDS.

THE SCRUBBERS OPERATED CONTINUOUSLY THROUGHOUT THE QUARTER EXCEPT FOR THE BALL AND GRID REPLACEMENT DOWNTIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM		100.0		100.0			720	720	720	
5/80	SYSTEM		100.0		100.0			744	744	744	
6/80	SYSTEM		100.0		100.0			720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

BOTH BOILER AND SCRUBBERS OPERATED THE ENTIRE APRIL-JUNE PERIOD.

THE ISOLATION DAMPERS ARE STILL EFFECTIVELY INOPERABLE AND A REPLACEMENT PLAN AS YET HAS NOT BEEN REESTABLISHED.

THE UTILITY REPORTED THAT THE REHEATER TUBE LEAK PROBLEM CONTINUED THROUGH THE SECOND QUARTER. THE TUBES WILL BE ENTIRELY REPLACED WITH NEW 316L SS BUNDLES DURING THE NEXT SCHEDULED OUTAGE IN NOVEMBER AND DECEMBER. DURING THE SECOND QUARTER MORE TUBES WERE BLANKED OFF AFTER STEAM LEAKS OCCURRED. TO DATE ROUGHLY 50% OF THE TUBES ARE SEALED OFF AND ARE OUT OF SERVICE BECAUSE OF LEAKS THAT OCCURRED OVER THE PAST MONTHS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
8/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
9/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND SCRUBBERS OPERATED ACCEPTABLY DURING THE JULY-SEPTEMBER PERIOD. NO PLANS HAVE BEEN MADE TO REPAIR THE ISOLATION DAMPERS. THE FAULTY REHEATER TUBES WILL BE REPLACED DURING THE SCHEDULED OUTAGE NOW SET FOR THE FIRST THREE WEEKS OF DECEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE OCTOBER THROUGH DECEMBER PERIOD THE REHEATER TUBES WERE NOT REPLACED AND THE UNIT IS OPERATING WITHOUT REHEAT UNTIL THE NEXT SCHEDULED OUTAGE PERIOD IN FEBRUARY 1981.

NO MAJOR SCRUBBER RELATED PROBLEMS WERE ENCOUNTERED, EXCEPT THE REPLACEMENT OF THE DISCHARGE VALVE ON THE RECIRCULATION PUMP.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                      PUBLIC SERVICE OF COLORADO
PLANT NAME                                        CHEROKEE
UNIT NUMBER                                       1
CITY                                              DENVER
STATE                                             COLORADO
REGULATORY CLASSIFICATION                         ******
PARTICULATE EMISSION LIMITATION - NG/J              43.        (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                    ******       (****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                    ******       (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                  710
GROSS UNIT GENERATING CAPACITY - MW                 115
NET UNIT GENERATING CAPACITY W/FGD - MW             100
NET UNIT GENERATING CAPACITY WO/FGD - MW            105
EQUIVALENT SCRUBBED CAPACITY - MW                   102

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                              BABCOCK & WILCOX
     BOILER TYPE                                  PULVERIZED COAL
     BOILER SERVICE LOAD                          ******
     DESIGN BOILER FLUE GAS FLOW - CU.M/S           245.39     ( 520000 ACFM)
     BOILER FLUE GAS TEMPERATURE - C                146.1      ( 295 F)
     STACK HEIGHT - M                             ******       (**** FT)
     STACK SHELL                                  ******
     STACK TOP DIAMETER - M                       *******      (***** FT)

 ** FUEL DATA
     FUEL TYPE                                    COAL
     FUEL GRADE                                   BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                   23493.       ( 10100 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                ******
     AVERAGE ASH CONTENT - %                          12.50
     RANGE ASH CONTENT - %                        9.4-12.5
     AVERAGE MOISTURE CONTENT - %                     11.30
     RANGE MOISTURE CONTENT - %                   ******
     AVERAGE SULFUR CONTENT - %                         .65
     RANGE SULFUR CONTENT - %                     ******
     AVERAGE CHLORIDE CONTENT - %                       .01
     RANGE CHLORIDE CONTENT - %                   ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
     NUMBER                                        1

 ** FABRIC FILTER
     NUMBER                                        0
     TYPE                                         NONE

 ** ESP
     NUMBER                                        1

 ** PARTICLE SCRUBBER
     NUMBER                                        1
     GENERIC TYPE                                 PACKED TOWER
     SUPPLIER                                     AIR CORRECTION DIVISION, UOP
     SHELL GENERIC MATERIAL                       CARBON STEEL
     SHELL SPECIFIC MATERIAL                      AISI 1110
     LINER GENERIC MATERIAL                       ORGANIC
     LINER SPECIFIC MATERIAL                      RUBBER
     GAS CONTACTING DEVICE TYPE                   STAINLESS STEEL, 1.5 INCH PLASTIC SPHERES
     NUMBER OF CONTACTING ZONES                    3
     L/G RATIO - LITER/CU.M                           7.5      (56.0 GAL/1000ACF)
     PRESSURE DROP - KPA                              3.2      (13.0 IN-H2O)
     SUPERFICIAL GAS VELOCITY - M/S                   3.4      (    11.0 FT/S)
     INLET GAS FLOW RATE - CU.M/S                   164.4      ( 348400 ACFM)
     INLET GAS TEMPERATURE - C                      146.1      (  295 F)
     SO2 REMOVAL EFFICENCY - %                       16.0
     PARTICLE REMOVAL EFFICIENCY - %                 97.0
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PUBLIC SERVICE OF COLORADO: CHEROKEE 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/73	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN JUNE 1973 SCALING AND PLUGGING AT THE WET/DRY ZONE, ON THE FIRST STAGE GRIDS, AND IN THE REHEATERS HAVE BEEN THE MOST PROMINENT PROBLEM AREAS CHARACTERIZED BY THIS SYSTEM. VARIOUS CHEMICAL ADDITIVES HAVE BEEN TESTED FOR CONTROL OF SCALING, INCLUDING PHOSPHATED ESTERS, BUT WITHOUT SIGNIFICANT IMPROVEMENT. BLOWDOWN IS MAINTAINED AT A HIGH LEVEL TO CHECK THE BUILDUP OF SALTS BUT, OTHER THAN FOR TESTING PURPOSES NO CHEMICAL CONTROL METHOD HAS BEEN USED TO CONTROL SCALE ACCUMULATION. OTHER OPERATING EXPERIENCES INCLUDE WEAR AND PERIODIC REPLACEMENT OF THE MOBILE BALLS, EROSION OF LINING AND CORROSIVE FAILURE OF REHEATERS. THE EROSION AND LINING FAILURE HAVE NOT BEEN A SERIOUS PROBLEM EXCEPT IN THE RECIRCULATING PUMPS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD ID FAN FAILURES HAVE OCCURRED DUE TO EROSION FROM THE FLYASH.

THE ISOLATION DAMPER HAS BEEN A PROBLEM DUE TO FREEZE UPS MAKING IT INOPERATIVE.

REHEATER FAILURES HAVE OCCURRED DUE TO PLUGGING OF THE HOT AIR INJECTION STEAM COILS.

THE SCRUBBER EXIT DUCTWORK WILL BE REPAIRED TEMPORARILY WITH A SPRAY ON FIBERGLASS-LIKE MATERIAL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM		100.0		100.0			744	744	744	
2/80	SYSTEM		100.0		100.0			696	696	696	
3/80	SYSTEM		100.0		100.0			744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBERS OPERATED CONTINUOUSLY THROUGHOUT THE FIRST QUARTER OF 1980.

THE ISOLATION DAMPERS HAVE NOT CAUSED ANY PROBLEMS BECAUSE MODULE ISOLATION WAS NOT REQUIRED DURING THE PERIOD.

THE FANS ARE STILL EXPERIENCING EROSION PROBLEMS.

IN MARCH A BOILER/SCRUBBER OVERHAUL BEGAN. DURING THIS TIME THE CARBON STEEL ISOLATION DAMPERS WILL BE REPLACED WITH 316 SS. THE NEW FANS WILL BE INSTALLED IN THE OLD HOUSINGS. THE NEW HIGH STRENGTH CARBON STEEL FANS WILL BE EQUIPPED WITH REPLACEABLE CHROMIUM ALLOY WEAR PLATE BLADE TIPS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

PUBLIC SERVICE OF COLORADO: CHEROKEE 1 (CONT.)

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-----------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                             THE 1B ID FAN WAS SEVERELY ERRODED.  THE FAN WAS REBUILT DURING THE OUTAGE.

                             THE OLD CARBON STEEL ISOLATION DAMPERS WERE REPLACED WITH 316 SS DAMPERS
                             DURING THE CONTINUING MAY-JULY OUTAGE.

 7/80  SYSTEM                                                                744

 8/80  SYSTEM                                                                744

 9/80  SYSTEM                                                                720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                             SHAFT BEARING FAILURES ON THE RECIRCULATION PUMP CAUSED SCRUBBER SYSTEM
                             PROBLEMS THROUGHOUT THE JULY-SEPTEMBER PERIOD.

10/80  SYSTEM                                                                744

11/80  SYSTEM                                                                720

12/80  SYSTEM                                                                744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                             THE UTILITY REPORTED NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE OCTOBER
                             THROUGH DECEMBER PERIOD.  HOWEVER, SHAFT BEARING REPAIRS WERE MADE TO THE
                             RECIRCULATION PUMPS.
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SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	PUBLIC SERVICE OF COLORADO	
PLANT NAME	CHEROKEE	
UNIT NUMBER	4	
CITY	DENVER	
STATE	COLORADO	
REGULATORY CLASSIFICATION	******	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	710	
GROSS UNIT GENERATING CAPACITY - MW	375	
NET UNIT GENERATING CAPACITY W/FGD - MW	350	
NET UNIT GENERATING CAPACITY WO/FGD - MW	375	
EQUIVALENT SCRUBBED CAPACITY - MW	356	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	******	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	717.29	(1520000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	135.0	(275 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23493.	(10100 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	12.50	
RANGE ASH CONTENT - %	9.4-12.5	
AVERAGE MOISTURE CONTENT - %	11.30	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.65	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	.01	
RANGE CHLORIDE CONTENT - %	******	

*** PARTICLE CONTROL

** MECHANICAL COLLECTOR

NUMBER	1

** FABRIC FILTER

NUMBER	0
TYPE	NONE

** ESP

NUMBER	1

** PARTICLE SCRUBBER

NUMBER	4	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	RUBBER	
GAS CONTACTING DEVICE TYPE	STAINLESS STEEL, 1.5 INCH PLASTIC SPHERES	
NUMBER OF CONTACTING ZONES	3	
L/G RATIO - LITER/CU.M	7.5	(56.0 GAL/1000ACF)
PRESSURE DROP - KPA	3.2	(13.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.4	(11.0 FT/S)
SO2 REMOVAL EFFICENCY - %	16.0	
PARTICLE REMOVAL EFFICIENCY - %	97.0	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/74	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN JULY 1974 SCALING AND PLUGGING AT THE WET/DRY ZONE, ON THE FIRST STAGE GRIDS, AND IN THE REHEATERS HAVE BEEN THE MOST PROMINENT PROBLEM AREAS CHARACTERIZED BY THIS SYSTEM. VARIOUS CHEMICAL ADDITIVES HAVE BEEN TESTED FOR CONTROL OF SCALING, INCLUDING PHOSPHATED ESTERS, BUT WITHOUT SIGNIFICANT IMPROVEMENT. BLOWDOWN IS MAINTAINED AT A HIGH LEVEL TO CHECK THE BUILDUP OF SALTS BUT, OTHER THAN FOR TESTING PURPOSES NO CHEMICAL CONTROL METHOD HAS BEEN USED TO CONTROL SCALE ACCUMULATION. OTHER OPERATING EXPERIENCES INCLUDE WEAR AND PERIODIC REPLACEMENT OF THE MOBILE BALLS, EROSION OF LINING AND CORROSIVE FAILURE OF REHEATERS. THE EROSION AND LINING FAILURE HAVE NOT BEEN A SERIOUS PROBLEM EXCEPT IN THE RECIRCULATING PUMPS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD ID FAN FAILURES HAVE OCCURRED DUE TO EROSION FROM THE FLYASH.

THE ISOLATION DAMPER HAS BEEN A PROBLEM DUE TO FREEZE UPS MAKING IT INOPERATIVE.

REHEATER FAILURES HAVE OCCURRED DUE TO PLUGGING OF THE HOT AIR INJECTION STEAM COILS.

THE SCRUBBER EXIT DUCTWORK WILL BE REPAIRED TEMPORARILY WITH A SPRAY ON FIBERGLASS LIKE MATERIAL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE OUTLET DUCT WORK IS BEING REBUILT INTERNALLY WITH FIBERGLASS FOR STRUCTURAL SUPPORT AND ACID RESISTANCE. WITH REGULAR MAINTENANCE THE UTILITY EXPECTS THIS TO PROVE TO BE A PERMANENT SOLUTION TO THE EROSION/CORROSION PROBLEM.

THE OLD FANS ARE BEING REPLACED WITH HIGH STRENGTH CARBON STEEL FANS HAVING REPLACABLE CHROMIUM ALLOY WEAR PLATE BLADE TIPS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM							720			
5/80	SYSTEM							744			
6/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE NEW FANS DESCRIBED DURING THE LAST REPORT PERIOD WERE INSTALLED IN ONE OF THE FOUR MODULES. NEW FANS WILL BE INSTALLED IN THE OTHER THREE MODULES DURING A SCHEDULED LATE SEPTEMBER OUTAGE UNLESS THE UTILITY HAS AN OPPOR-

PUBLIC SERVICE OF COLORADO: CHEROKEE 4 (CONT.)

PERFORMANCE DATA

TUNITY TO MAKE THE REPLACEMENTS SOONER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER RETURNED TO SERVICE IN MID JULY AFTER A TWO WEEK OUTAGE. DURING THIS TIME, THE FIBERGLASS INSIDE THE DUCTWORK WAS REPLACED, AND A VERTICAL GRID WAS INSTALLED ON THE SECOND LEVEL OF THE MOBILE BED TOWER TO IMPROVE SYSTEM PERFORMANCE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM WENT DOWN ON SEPTEMBER 15, 1980 FOR A SCHEDULED OVERHAUL. DURING THIS TIME, FANS WERE INSTALLED ON MODULES A, C, AND D.

THE UTILITY IS CURRENTLY EVALUATING THE VERTICAL GRID ON THE SECOND LAYER. IF THE GRID IMPROVES SYSTEM PERFORMANCE, THEY WILL INSTALL ANOTHER ONE ON THE THIRD LEVEL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 4 EXPERIENCED SOME MINOR REHEATER LEAKAGE PROBLEMS DURING THE PERIOD.

DURING THE FOURTH QUARTER OF 1980 THE UTILITY REPORTED THAT PROBLEMS WERE ENCOUNTERED WHEN VERITICAL GRIDS WERE INSTALLED ON THE SCRUBBER BED. THIS WAS INTENDED TO SOLVE THE PROBLEM OF KEEPING THE SCRUBBER BALLS FROM MOVING HORIZONTALLY, RESULTING IN PILES OF SCRUBBER BALLS IN LOCALIZED AREAS, BUT CORROSION AND SYSTEM PERFORMANCE DID NOT IMPROVE.

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

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COMPANY NAME                                      PUBLIC SERVICE OF COLORADO
PLANT NAME                                        VALMONT
UNIT NUMBER                                       5
CITY                                              VALMONT
STATE                                             COLORADO
REGULATORY CLASSIFICATION                         ******
PARTICULATE EMISSION LIMITATION - NG/J              43.          (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                    ******         (****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                    ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                  274
GROSS UNIT GENERATING CAPACITY - MW                 166
NET UNIT GENERATING CAPACITY W/FGD - MW             157
NET UNIT GENERATING CAPACITY WO/FGD - MW            163
EQUIVALENT SCRUBBED CAPACITY - MW                   166

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                              COMBUSTION ENGINEERING
     BOILER TYPE                                  PULVERIZED COAL
     BOILER SERVICE LOAD                          BASE
     DESIGN BOILER FLUE GAS FLOW - CU.M/S           436.98       ( 926000 ACFM)
     BOILER FLUE GAS TEMPERATURE - C                126.7        ( 260 F)
     STACK HEIGHT - M                             ******         (**** FT)
     STACK SHELL                                  ******
     STACK TOP DIAMETER - M                       *******        (***** FT)

 ** FUEL DATA
     FUEL TYPE                                    COAL
     FUEL GRADE                                   SUBBITUMINOUS
     AVERAGE HEAT CONTENT - J/G                   25121.         ( 10800 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                   ******
     AVERAGE ASH CONTENT - %                          6.00
     RANGE ASH CONTENT - %                        5.4-7.0
     AVERAGE MOISTURE CONTENT - %                    15.00
     RANGE MOISTURE CONTENT - %                   12.7-18.3
     AVERAGE SULFUR CONTENT - %                        .70
     RANGE SULFUR CONTENT - %                     0.68-.73
     AVERAGE CHLORIDE CONTENT - %                 ********
     RANGE CHLORIDE CONTENT - %                   ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
     NUMBER                                         1
     INLET FLUE GAS CAPACITY - CU.M/S               218.5        ( 463000 ACFM)

 ** FABRIC FILTER
     NUMBER                                         0
     TYPE                                         NONE

 ** ESP
     NUMBER                                         1
     TYPE                                         COLD SIDE
     INLET FLUE GAS CAPACITY - CU.M/S               218.5        ( 463000 ACFM)

 ** PARTICLE SCRUBBER
     NUMBER                                         2
     GENERIC TYPE                                 PACKED TOWER
     SPECIFIC TYPE                                MOBILE BED PACKING
     SUPPLIER                                     AIR CORRECTION DIVISION, UOP
     SHELL GENERIC MATERIAL                       CARBON STEEL
     SHELL SPECIFIC MATERIAL                      AISI 1110
     LINER GENERIC MATERIAL                       ORGANIC
     LINER SPECIFIC MATERIAL                      RUBBER
     GAS CONTACTING DEVICE TYPE                   STAINLESS STEEL, 1.5 INCH PLASTIC SPHERES
     NUMBER OF CONTACTING ZONES                     3
     L/G RATIO - LITER/CU.M                           7.8        (58.3 GAL/1000ACF)
     PRESSURE DROP - KPA                              3.7        (15.0 IN-H2O)
     SUPERFICIAL GAS VELOCITY - M/S                   3.4        (   11.0 FT/S)
     INLET GAS FLOW RATE - CU.M/S                   109.2        ( 231500 ACFM)
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INLET GAS TEMPERATURE - C	132.8	(271 F)
SO2 REMOVAL EFFICENCY - %	45.0	
PARTICLE REMOVAL EFFICIENCY - %	96.0	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/71	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST PARTICLE MATTER SCRUBBER COMMENCED OPERATION IN NOVEMBER 1971. THE SCRUBBER WAS ORIGINALLY INSTALLED FOR PARTICLE MATTER REMOVAL SINCE THE PLANT BURNS LOW SULFUR COAL; HOWEVER, 45% OF THE SO2 IS REMOVED AS WELL BECAUSE OF THE ALKALINITY OF THE FLYASH.

DURING THE FIRST YEAR OF OPERATION PROBLEMS INCLUDED DIFFICULTIES WITH THE MODULE PACKING GRID SUPPORT, GENERAL VESSEL SCALE FORMATION, FLOW DISTRIBUTION PROBLEMS, BALL BREAKAGE, SCALING IN THE MIST ELIMINATOR SECTION, AND PLUGGING OF THE REHEATER. SCALE FORMATION WAS THE MOST PREDOMINANT CONTINUING MAJOR CAUSE OF DOWNTIME IN THE SCRUBBER. SCALE ACCUMULATION WAS NOTED ON THE WET-DRY INTERFACE IMMEDIATELY DOWNSTREAM OF THE PRESATURATION NOZZLES. SCALE ALSO ACCUMULATED HEAVILY ON THE UNDERSIDE OF THE FIRST LAYER OF GRID BARS.
SCALE ON THE UPPER GRID BARS WAS LESS PREVALENT AS THE ACTION OF THE "PING PONG" BALLS TENDED TO KEEP THE SCALE OFF OF THESE SECTIONS. SCALE ALSO COLLECTED ON THE WALLS OF THE VESSEL AND INTERMITTENTLY SLOUGHED OFF AND FELL INTO THE SUMP IN LARGE PIECES CAUSING BLOCKAGE OF THE RECIRCULATION PUMP SUCTION SCREENS. SCALING OF THE MIST ELIMINATOR ABATED SOMEWHAT WITH THE INTRODUCTION OF A CLEAR RINSE WATER WASH. SCALE FORMATION IN THE REHEAT SECTION SOMETIMES REQUIRED SUPPLEMENTAL CLEANING OF THE REHEATER IN ADDITION TO THE CLEANING OBTAINED BY THE USE OF THE SOOTBLOWERS WHICH WERE INSTALLED AS A PART OF THE REHEATER EQUIPMENT. UNDER NORMAL OPERATION, THE SOOTBLOWERS LOCATED IN THIS REHEAT SECTION WERE FAIRLY SUCCESSFUL IN REMOVING THE ACCUMULATION OF THE SCALE IN THE REHEATER.
ALTHOUGH MANY OF THE INITIAL START-UP PROBLEMS WERE SOLVED OVER A PERIOD OF TIME, THE CALCIUM SULFATE-FLYASH SCALING CONTINUED TO BE A SIGNIFICANT OPERATING PROBLEM AT THE VALMONT INSTALLATION. IN ADDITION TO THESE SCALING RELIABILITY PROBLEMS, A WATER QUALITY CONCERN ALSO SURFACED THAT WAS A DIRECT RESULT OF THE PARTICLE SCRUBBER OPERATION. THE RELATIVELY HIGH CAO CONCENTRATION IN THE VALMONT FLYASH RESULTED IN FAIRLY HIGH SO2 REMOVAL RATES (45-50 PERCENT) WITHIN THE UNITS. SINCE NO PH CONTROL CAPABILITY FOR EITHER THE RECIRCULATING SLURRY OR THE SYSTEM BLOWDOWN SLURRY WAS DESIGNED INTO THE SYSTEM, AN ACID CONDITION WAS CREATED IN THE SLURRY AND THE BLOWDOWN STREAM. PH LEVELS OF THE BLOWDOWN NORMALLY RANGED BETWEEN 1.7 AND 2.0. ALTHOUGH THE STREAM WAS NEUTRALIZED TO A DEGREE BY ALKALINE FLYASH, PSCC FELT THAT IT WAS IMPORTANT TO INVESTIGATE VARIOUS CONTROL MEASURES WHICH COULD BE APPLIED TO THIS STREAM. THE CALCIUM SULFATE SCALING PROBLEM WAS THOUGHT TO BE THE RESULT OF A SUPER-SATURATED CALCIUM SULFATE CONDITION IN THE RECIRCULATING SLURRY. BECAUSE OF THIS IT WAS FELT THAT CONTINUOUS PH CONTROL OF THE RECIRCULATING SLURRY, CONVERSION OF THE SYSTEM TO CLOSED LOOP OPERATION AND ESTABLISHING A HIGHER CONCENTRATION OF SEEDING SOLIDS IN THE RECIRCULATION SLURRY (THEREBY CONTROLLING THE SCALING PROBLEMS WITHOUT CHEMICAL ADDITIVES) WOULD BE NECESSARY MEASURES.
FOR PH CONTROL, LIMESTONE WAS TESTED INITIALLY, THEN LIME WAS UTILIZED FOR THE ALKALI REAGENT. IN THE FIRST TEST, SINCE LIMESTONE UTILIZATION WAS A MAJOR CONCERN, A SPECIAL EFFORT WAS MADE TO REDUCE THE POTENTIAL FOR THE SHORT CIRCUITING OF THE ADDED LIMESTONE AND TO PROVIDE SUFFICIENT RESIDENCE TIME IN THE REACTOR SECTION OF THE SYSTEM. BY UTILIZING FOUR REACTION MIX TANKS IN SERIES, PLUG FLOW WAS EXPECTED TO BE MORE CLOSELY SIMULATED. TO MAINTAIN A CLOSED LOOP SYSTEM WHERE THE QUANTITY OF WATER REMOVED FROM THE SYSTEM WAS HELD TO A MINIMUM, FOUR SYSTEM DESIGN FEATURES WERE UTILIZED.

1. UTILIZATION OF A COMBINATION OF POND SUPERNATANT AND MAKE-UP WATER FOR RECYCLE WATER.
2. PRESATURATION OF THE INCOMING FLUE GAS WITH RECIRCULATING SLURRY.
3. INTERMITTENT MIST ELIMINATOR WASH.
4. PROPER SELECTION OF MATERIALS OF CONSTRUCTION TO PROTECT AGAINST

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

PERFORMANCE DATA

ATTACK CAUSED BY HIGH CHLORIDE CONCENTRATIONS.

THE SCRUBBERS R & D FACILITY WAS NOT EQUIPPED WITH A MECHANICAL THICKENER FOR CONTROL OF THE SUSPENDED SOLIDS CONCENTRATION OF THE RECIRCULATING SLURRY (ALL PURGED MATERIAL WAS SENT TO THE SLUDGE POND). WITH A 500 PPM SO2 CONCENTRATION IN THE FLUE GAS, IT IS EXPECTED THAT THE RECIRCULATING SLURRY SOLIDS COULD BE REALLY CONTROLLED IN THE 5 TO 7 PERCENT RANGE. DUE TO THE MIXED FUEL FIRED AT THE UNIT DURING THE TEST PERIOD, HOWEVER, THE SO2 CONCENTRATIONS EMITTED FROM THE BOILER AND HENCE PRESENT IN THE FLUE GAS STREAM VARIED SIGNIFICANTLY AND FINALLY FELL TO SUCH LOW LEVELS (OFTEN 100-200 PPM) THAT SUSPENDED SOLIDS CONCENTRATIONS IN THE SLURRY COULD NOT BE MAINTAINED. IT IS ALMOST CERTAIN THAT A THICKENER, WITH THE SUBSEQUENT RETURN OF SOLIDS TO THE SCRUBBER LIQUOR, COULD HAVE BEEN USED TO GOOD ADVANTAGE DURING THIS TIME PERIOD. GENERALLY SPEAKING, THE SEVERE SCALING CONDITIONS PLAGUING THE TEST MODULE WERE INTENSIFIED DURING THESE PERIODS OF LOW INLET SO2 CONDITION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/74	SYSTEM							720			
12/74	SYSTEM							744			
1/75	SYSTEM							744			
2/75	SYSTEM							672			
3/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SCRUBBING SYSTEM WAS OPERATED FOR A TOTAL OF FOUR AND ONE-HALF MONTHS, FROM MID-OCTOBER 1974 TO MARCH 1975. THE OVERALL RELIABILITY OF THE SYSTEM WAS APPROXIMATELY 75%.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/75	SYSTEM							720			
5/75	SYSTEM							744			
6/75	SYSTEM							720			
7/75	SYSTEM							744			
8/75	SYSTEM							744			
9/75	SYSTEM							720			
10/75	SYSTEM							744			
11/75	SYSTEM							720			
12/75	SYSTEM							744			
1/76	SYSTEM							744			
2/76	SYSTEM							696			
3/76	SYSTEM							744			
4/76	SYSTEM							720			
5/76	SYSTEM										
6/76	SYSTEM							720			
7/76	SYSTEM							744			
8/76	SYSTEM							744			

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/76	SYSTEM							720			
10/76	SYSTEM							744			
11/76	SYSTEM							720			
12/76	SYSTEM							744			
1/77	SYSTEM							744			
2/77	SYSTEM							672			
3/77	SYSTEM							744			
4/77	SYSTEM							720			
5/77	SYSTEM							744			
6/77	SYSTEM							720			
7/77	SYSTEM							744			
8/77	SYSTEM							744			
9/77	SYSTEM							720			
10/77	SYSTEM							744			
11/77	SYSTEM							720			
12/77	SYSTEM							744			
1/78	SYSTEM							744			
2/78	SYSTEM							672			
3/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THERE HAVE BEEN RECURRING PROBLEMS ASSOCIATED WITH BALL MIGRATION IN THE BALL COMPARTMENT AS WELL AS RECIRCULATION PUMP MOTOR BEARING FAILURE, AND WEAR AND FAILURE IN THE BALL COMPARTMENT LINING. THERE HAVE BEEN CONTINUAL PROBLEMS WITH REHEATER PLUGGING. THERE ALSO HAVE BEEN EXPANSION JOINT FAILURES AT BOTH THE INLET AND OUTLET OF THE SCRUBBER.
MORE RECENTLY THERE WAS A PINCH BELT FAILURE.
THE SCRUBBING SYSTEM HAS HAD AN AVAILABILITY RANGE OF 50 TO 78% WITH AN AVERAGE OF 66%.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/78	SYSTEM							720			
5/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO SIGNIFICANT PROBLEMS WERE ENCOUNTERED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/78	SYSTEM							720			
7/78	SYSTEM							744			
8/78	SYSTEM							744			

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAD NO COMMENTS FOR THIS PERIOD.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/78	SYSTEM							720			
10/78	SYSTEM							744			
11/78	SYSTEM							720			
12/78	SYSTEM							744			
1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			
5/79	SYSTEM							744			
6/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

AVERAGE SCRUBBER AVAILABILITY FROM START UP THROUGH APRIL 1979 WAS 64.42%.
AVERAGE SCRUBBER AVAILABILITY FOR 1978 WAS 66.85%.
AVERAGE SCRUBBER AVAILABILITY FROM JANUARY 1, 1979 THROUGH MAY, 1979 WAS APPROXIMATELY 80%.

BALL MIGRATION, ALTHOUGH NOT SERIOUS, IS A CHRONIC PROBLEM FOR VALMONT 5.

EROSION AND CORROSION HAVE OCCURRED ON THE SCRUBBER GRID BAR AREA (PACKING SUPPORT).

EROSION/CORROSION IS EVIDENT IN THE MIST ELIMINATOR SECTION.

EROSION/CORROSION OCCURRS IN THE REHEATER AREA AND SOOT BLOWER.

THE UTILITY HAD TO REPLACE INLET AND OUTLET EXPANSION JOINTS.

REHEATER PLUGGING HAS BEEN A PROBLEM.

RECYCLE PUMP BEARING FAILURES OCCURRED.

THE JACK SCREW DRIVE HAS BEEN MALFUNCTIONING ON INLET AND OUTLET ISOLATION DAMPERS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE ANNUAL SHUTDOWN IN SEPTEMBER THE OLD SCRUBBER BALLS WERE REPLACED WITH A NEW BRAND. DUE TO BALL MOTION THE RUBBER LINER ERODED.

IN THE MIST ELIMINATOR SECTION EROSION AND CORROSION OCCURRED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM	100.0						744			

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	SYSTEM	92.3						720			
12/79	SYSTEM	98.1						744			

** PROBLEMS/SOLUTIONS/COMMENTS

ONE OF THE MAJOR SCRUBBING SYSTEM PROBLEMS IS THE SCRUBBER WALL WEAR WHICH HAS TO BE PATCHED DURING THE SPRING AND FALL.

REHEATER PLUGGING HAS BEEN A CHRONIC PROBLEM.

THE UTILITY HAS REPORTED THE FOLLOWING ANNUAL AVAILABILITIES FOR THE UNIT.

1972 - 1978: 64.3%
1972 - 1979: 65.9%
1978: 66.8%
1979: 80.5%

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	A	98.5									
	B	98.5									
	SYSTEM	98.5						744			
2/80	A	84.4									
	B	94.9									
	SYSTEM	89.7						696			
3/80	A	90.8									
	B	87.7									
	SYSTEM	89.0						744	615		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER OF 1980, NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE SCRUBBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	A	88.1									
	B	88.1									
	SYSTEM	88.1						720	716		

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS SHUT DOWN ON APRIL 14 FOR A WEEK TO MAKE REPAIRS TO A HOLE IN THE SCRUBBER RUBBER LINING, RECYCLE PUMP LININGS AND A STEAM REGULATOR ON ONE OF THE REHEATERS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/80	A	96.8									
	B	100.0									
	SYSTEM	98.4						744	744		

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS WERE REPORTED FOR MAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/80	A	8.0									
	B	8.0									
	SYSTEM	8.0						720	720		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE SCRUBBER WAS FORCED OUT OF SERVICE WHEN AN INBOARD FAN PEDISTLE BEARING FAILED. THE BEARING SECTION WAS REBUILT.

WHILE FAN REPAIRS WERE IN PROGRESS EXTENSIVE MAINTENANCE WAS PERFORMED ON THE SCRUBBER. MAINTENANCE WORK INCLUDED COMPLETE BALL REPLACEMENT, ADDI-

PUBLIC SERVICE OF COLORADO: VALMONT 5 (CONT.)

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------------------------------------------PERFORMANCE DATA--------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                         TIONAL REPAIR WORK ON THE SCRUBBER LINER, REPAIR OF HOLES IN THE TOWER
                         SHELL AND OF A RUPTURED MIST ELIMINATOR WASH LINE AND THE REHEATER WAS
                         CLEANED.

                         DAMPER JAMMING AT VALMONT HAS OCCURRED PERIODICALLY.  SOMETIMES DAMPERS DO
                         NOT READILY CLOSE.  THE OPERATOR MUST MOVE THE DAMPER UP AND DOWN UNTIL THE
                         GUILLOTINE SEATS.  BECAUSE OF CONTINUOUS FLY ASH ACCUMULATION IT APPEARS
                         THAT THE DAMPERS MUST BE EXERCISED FREQUENTLY TO PREVENT JAMMING.

 7/80  5A                  48.3                    46.6
       5B                  48.3                    46.6
       SYSTEM              48.3                    46.6                    744   719    347

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE SCRUBBER SYSTEM WAS SHUT DOWN BECAUSE OF SCRUBBER BOOSTER FAN
                         BEARING FAILURE.

 8/80  5A                  87.5                    84.8
       5B                  95.6                    92.6
       SYSTEM              91.5                    87.7                    744   721    660

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE RECIRCULATION PUMP MOTOR BEARING FAILED CAUSING SOME MINOR OUTAGE
                         TIME IN AUGUST.

 9/80  SYSTEM                                        .0                    720     0      0

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE BOILER AND SCRUBBER WERE SHUT DOWN DURING SEPTEMBER FOR SCHEDULED
                         MAINTENANCE.

10/80  SYSTEM                                                              744

11/80  SYSTEM                                                              720

12/80  SYSTEM                                                              744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE SCRUBBER REMAINED OUT OF SERVICE THROUGHOUT THE OCTOBER-DECEMBER PERIOD
                         AND IS EXPECTED TO START UP AT THE END OF JANUARY.  LATE START UP OF THE
                         SCRUBBER IS DUE TO A MANPOWER SHORTAGE.  THE BOILER AND TURBINE RETURNED TO
                         SERVICE IN MID-DECEMBER.
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SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICLE SCRUBBERS

COMPANY NAME	SOUTHWESTERN PUBLIC SERVICE	
PLANT NAME	HARRINGTON	
UNIT NUMBER	1	
CITY	AMARILLO	
STATE	TEXAS	
REGULATORY CLASSIFICATION	******	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	360	
GROSS UNIT GENERATING CAPACITY - MW	360	
NET UNIT GENERATING CAPACITY W/FGD - MW	320	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	360	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	778.63	(1650000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	176.7	(350 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	8.2	(27.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19538.	(8400 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8000-8900
AVERAGE ASH CONTENT - %	5.00	
RANGE ASH CONTENT - %	4.5-6	
AVERAGE MOISTURE CONTENT - %	27.10	
RANGE MOISTURE CONTENT - %	25-30	
AVERAGE SULFUR CONTENT - %	.42	
RANGE SULFUR CONTENT - %	.39-.45	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	778.6	(1650000 ACFM)
INLET FLUE GAS TEMPERATURE - C	168.3	(335 F)
PRESSURE DROP - KPA	.1	(1. IN-H2O)
PARTICLE REMOVAL EFFICENCY - %	95.0	
** PARTICLE SCRUBBER		
NUMBER	6	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	STATIC BED PACKING	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	24 X 25	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
GAS CONTACTING DEVICE TYPE	316L SS FIBERGLASS ALLOY 20	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	444.1	(7050 GPM)
L/G RATIO - LITER/CU.M	3.1	(23.0 GAL/1000ACF)
SUPERFICIAL GAS VELOCITY - M/S	2.4	(8.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	141.6	(300000 ACFM)
INLET GAS TEMPERATURE - C	60.0	(140 F)
PARTICLE REMOVAL EFFICIENCY - %	50.0	

SOUTHWESTERN PUBLIC SERVICE: HARRINGTON 1 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THROUGH DECEMBER, TWO SPRAY PUMP MOTORS FAILED.

THE FRP FLUSH PIPING HAS FAILED CAUSING SOME LEAKING.

PLUGGING IN ONE MARBLE BED WAS ENCOUNTERED WHEN THE CHEMISTRY CONTROL WAS TEMPORARILY LOST.

THE CONE SHAPED EXPANDED METAL (316L SS) SCREENS COVERING THE BED DRAIN PIPES HAVE ERODED AWAY FROM BALL MOVEMENT. THE MARBLE BALLS HAVE BEEN DROPPING INTO THE RECYCLE TANK. WHERE THE UTILITY HAS REPLACED THE METAL SCREEN WITH EXPANDED PLASTIC SCREEN, EROSION HAS NOT OCCURRED.

1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER OF 1980 THE MIST ELIMINATOR WASH PIPING RUPTURED CAUSING PLUGGING IN SCRUBBERS 4 AND 5. THE UTILITY PLANS TO REPLACE ALL FRP PIPING WITH STEEL. THE RUPTURE ON NO. 5 ALSO DAMAGED THE WATER SUPPLY HEADER.

THE MARBLE BED PLUGGING REPORTED DURING THE LAST QUARTER IS NOT YET COMPLETELY CLEARED. THE SOFT SCALE IS GRADUALLY GOING BACK INTO THE SOLUTION. THE PLATE AREA IS CLEAN.

THE DUCT BENEATH THE REHEATER TUBING ON ONE OF THE MODULES HAS CORRODED TO THE POINT THAT HOLES HAVE FORMED. SCALE AND MOISTURE WERE FOUND ON THE PLATE WHERE THE CORROSION FORMED. THE PLATE WAS REMOVED AND A NEW CARBON STEEL PLATE WAS WELDED IN. NO OTHER REHEATER DUCTS HAVE EXPERIENCED ANY SCALE OR MOISTURE ACCUMULATION.

4/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

A PUMP LINER FAILURE OCCURRED IN APRIL. THE IMPELLER SHAFT LINER WAS REPAIRED AND REPLACED.

5/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUT DOWN A FEW DAYS IN LATE APRIL AND 12 TO 14 DAYS IN EARLY MAY FOR AIR PREHEATER REPAIRS.

DURING APRIL AND MAY THE SCRUBBING SYSTEM EXPERIENCED AGITATOR PROBLEMS. THE RECENT PROBLEMS HAVE BEEN RELATED TO BEARING FAILURE, HOWEVER, THE SEALS HAVE BEEN LEAKING AS WELL. THE AGITATORS AT THIS FACILITY ARE SIDE MOUNTED. THE AGITATOR SHAFT ENTERS THE TANK AT ROUGHLY 12 FT BELOW THE FLUID SURFACE. IT APPEARS THAT THE SEAL LEAKING MAY BE ATTRIBUTABLE TO FAULTY INSTALLATION.

SOUTHWESTERN PUBLIC SERVICE: HARRINGTON 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/80	SYSTEM	92.1						720	696		79.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE SCRUBBER EXHIBITED AN AVAILABILITY OF 92.1%. THERE WAS GREATER SCRUBBER CAPACITY AVAILABLE THAN REQUIRED BY THE BOILER. NO PROBLEMS WERE REPORTED FOR JUNE.

DAMPER PROBLEMS REPORTED PREVIOUSLY HAVE BEEN ELIMINATED. THE OLD OPERATOR MECHANISMS WERE REPLACED WITH OPERATORS SUPPLIED BY ANOTHER MANUFACTURER.

ONE OF THE MARBLE BEDS IS STILL PARTIALLY PLUGGED. THE MATERIAL SEEMS TO BE HARD CALCIUM SULFATE SCALE. THE SCALE WILL PROBABLY NOT CLEAR FURTHER THROUGH DISSOLUTION DURING NORMAL SCRUBBER OPERATIONS AS HAD BEEN HOPED. ALTHOUGH THE MODULE MUST OPERATE AT LOWER THAN DESIGN GAS FLOW SCRUBBER OPERATIONS ARE NOT HAMPERED OVERALL BECAUSE THE SYSTEM HAS SOME DESIGN SPARE CAPACITY.

THE REHEATER PROBLEM REPORTED PREVIOUSLY HAS OCCURRED ON THREE REHEATERS NOW. THE FAILURE OF THE REHEATER DUCT BOTTOM PANELS MAY BE A RESULT OF AN UNDERSIZED DEFLECTION SHIELD BENEATH THE TUBE BANKS. IT IS ALSO POSSIBLE THAT THE DUCTING WAS IMPROPERLY WELDED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	SYSTEM							744			
8/80	SYSTEM							744			
9/80	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR SCRUBBING SYSTEM PROBLEMS OCCURRED DURING THE THIRD QUARTER 1980.

THE PROBLEM REPORTED EARLIER WITH THE MIST ELIMINATOR WASH PIPING IS PRESENTLY BEING SOLVED BY REPLACING THE PIPING WITH CARBON STEEL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM							744			
11/80	SYSTEM							720			
12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE OCTOBER THROUGH DECEMBER PERIOD REPLACEMENT OF THE MIST ELIMINATOR WASH PIPING WITH CARBON STEEL CONTINUED; AS THE OLD PIPING WEARS OUT AND MAINTENANCE TIME PERMITS.

DURING LATE DECEMBER, THE SLURRY SPRAY PUMP HOUSING CRACKED DURING A BACK FLUSH. THIS WAS THE SECOND TIME IN TWO YEARS THAT THIS PROBLEM HAD OCCURRED.

SECTION 15
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

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COMPANY NAME                                    CHUGOKU ELECTRIC
PLANT NAME                                      SHIMONOSEKI
UNIT NUMBER                                     1
CITY                                            SHIMONOSEKI
STATE                                           JAPAN
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J          ******         (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                    219.         (  .510 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                  ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                575
GROSS UNIT GENERATING CAPACITY - MW               175
NET UNIT GENERATING CAPACITY W/FGD - MW         *****
NET UNIT GENERATING CAPACITY WO/FGD - MW        *****
EQUIVALENT SCRUBBED CAPACITY - MW                 175

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                            MITSUBISHI HEAVY INDUSTRIES
     BOILER TYPE                                PULVERIZED COAL
     BOILER SERVICE LOAD                        BASE
     DESIGN BOILER FLUE GAS FLOW - CU.M/S         266.27       ( 564255 ACFM)
     BOILER FLUE GAS TEMPERATURE - C              130.0        ( 266 F)
     STACK HEIGHT - M                             200.         ( 656 FT)
     STACK SHELL                                CONCRETE
     STACK TOP DIAMETER - M                         3.0        (   9.7 FT)

 ** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 ******
     AVERAGE HEAT CONTENT - J/G                 25046.         ( 10768 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                 ******
     AVERAGE ASH CONTENT - %                       24.60
     RANGE ASH CONTENT - %                      ******
     AVERAGE MOISTURE CONTENT - %                   2.30
     RANGE MOISTURE CONTENT - %                 ******
     AVERAGE SULFUR CONTENT - %                      .59
     RANGE SULFUR CONTENT - %                   ******
     AVERAGE CHLORIDE CONTENT - %                    .04
     RANGE CHLORIDE CONTENT - %                 0.014-0.106

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
     TYPE                                       MULTICLONES
     SUPPLIER                                   MITSUBISHI HEAVY INDUSTRIES

 ** FABRIC FILTER
     NUMBER                                      0
     TYPE                                       NONE

 ** ESP
     NUMBER                                      1
     TYPE                                       COLD SIDE
     SUPPLIER                                   MITSUBISHI HEAVY INDUSTRIES
     INLET FLUE GAS CAPACITY - CU.M/S             246.1        ( 521589 ACFM)
     INLET FLUE GAS TEMPERATURE - C               140.0        (  284 F)
     PRESSURE DROP - KPA                             .8        (  3. IN-H2O)

 ** PARTICLE SCRUBBER
     NUMBER                                      1
     GENERIC TYPE                               SPRAY TOWER
     SUPPLIER                                   MITSUBISHI HEAVY INDUSTRIES
     DIMENSIONS - FT                            66
     SHELL GENERIC MATERIAL                     CARBON STEEL
     SHELL SPECIFIC MATERIAL                    AISI 1110
     LINER GENERIC MATERIAL                     ORGANIC
     LINER SPECIFIC MATERIAL                    RUBBER
     NUMBER OF CONTACTING ZONES                  1
     LIQUID RECIRCULATION RATE - LITER/S          544.3        ( 8640 GPM)
     L/G RATIO - LITER/CU.M                         3.0        (22.5 GAL/1000ACF)
```

CHUGOKU ELECTRIC: SHIMONOSEKI 1 (CONT.)

SUPERFICIAL GAS VELOCITY - M/S	13.1	(43.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	203.7	(431725 ACFM)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	MITSUBISHI HEAVY INDUSTRIES
A-E FIRM	MITSUBISHI HEAVY INDUSTRIES
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
CURRENT STATUS	1
COMMERCIAL START-UP	7/79
INITIAL START-UP	5/79
CONTRACT AWARDED	5/77

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	COMBINATION	
SPECIFIC TYPE	TRAY/PACKED	
SUPPLIER	MITSUBISHI	
DIMENSIONS - FT	131.2 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	RESIN	
NUMBER OF CONTACTING ZONES	4	
LIQUID RECIRCULATION RATE - LITER/S	2722.	(43200 GPM)
GAS-SIDE PRESSURE DROP - KPA	1.0	(3.9 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(9.8 FT/S)
INLET GAS FLOW - CU. M/S	203.73	(431725 ACFM)
INLET GAS TEMPERATURE - C	50.0	(122 F)
SO2 REMOVAL EFFICIENCY - %	89.0	
PARTICLE REMOVAL EFFICENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
NUMBER OF STAGES	2	
PRESSURE DROP - KPA	.1	(.6 IN-H2O)
WASH WATER SOURCE	FRESH WATER	
WASH RATE - L/S	200.0	(3170 GAL/MIN)

** REHEATER

GENERIC TYPE	WASTE HEAT RECOVERY	
TRADE NAME/COMMON TYPE	LOW-SULFUR OIL	
TEMPERATURE INCREASE - C	140.0	(284 F)
INLET FLUE GAS FLOW RATE - CU. M/S	203.73	(431725 ACFM)
INLET FLUE GAS TEMPERATURE - C	105.0	(221 F)

** FANS

SUPPLIER	MITSUBISHI HEAVY INDUSTRIES	
FLUE GAS FLOW RATE - CU.M/S	294.04	(623108 ACFM)
FLUE GAS TEMPERATURE - C	140.0	(284 F)

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	5
NUMBER OF SPARES	0
FEED STREAM CHARACTERISTICS	25% SOLIDS
OUTLET STREAM CHARACTERISTICS	90% SOLIDS

CHUGOKU ELECTRIC: SHIMONOSEKI 1 (CONT.)

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	33 (DIA) X 10 (DEPTH)
FEED STREAM CHARACTERISTICS	5% SOLIDS
OUTLET STREAM CHARACTERISTICS	25% SOLIDS

*** SALEABLE BYPRODUCTS

NATURE	GYPSUM	
FULL LOAD QUANTITY - M T/H	6.98	(7.70 TPH)
QUALITY - %	99.0	

** WATER BALANCE

WATER LOOP TYPE	OPEN	
EVAPORATION WATER LOSS - LITER/S	3.0	(47 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	54	
MAKEUP WATER ADDITION - LITERS/S	6.8	(108 GPM)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/79	SYSTEM	100.0	100.0	100.0	50.0			744	372	372	
8/79	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
9/79	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

COMMERCIAL OPERATIONS BEGAN IN THE MIDDLE OF JULY 1979. THE FGD UNIT HAS OPERATED CONTINUOUSLY THROUGH THE THIRD QUARTER WITH NO PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/79	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
11/79	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
12/79	SYSTEM	100.0	93.5	100.0	93.5			744	744	696	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD UNIT OPERATED CONTINUOUSLY THROUGH THE FOURTH QUARTER EXCEPT FOR A 2 DAY SHUTDOWN TO INSPECT THE GAS-GAS HEATER DURING DECEMBER. THE BOILER WAS OPERATED FIRING A LOW SULFUR OIL DURING THE TWO DAYS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
2/80	SYSTEM	100.0	100.0	100.0	53.4			696	372	372	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY AND THE FIRST HALF OF FEBRUARY THE FGD UNIT OPERATED WITH NO PROBLEMS. THE BOILER WAS TAKEN OFF-LINE ON FEBRUARY 8 FOR SCHEDULED MAINTENANCE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/80	SYSTEM	100.0			.0			744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER REMAINED DOWN THROUGH MARCH FOR ANNUAL MAINTENANCE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM	100.0	100.0	100.0	182.4			720	593	593	

CHUGOKU ELECTRIC: SHIMONOSEKI 1 (CONT.)

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------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           DURING THE ANNUAL MAINTENANCE THE SCR (SELECTIVE CATALYTIC REDUCTION OF
                           NOX) UNIT WAS CONNECTED BETWEEN THE BOILER AND AIR PREHEATER.  AFTER THE
                           STARTUP ON APRIL 6, COAL ONLY HAS BEEN USED (BEFORE FEBRUARY, COAL AND
                           OIL WERE USED 50:50).  EXCEPT FOR A 2 HOUR SHUTDOWN FOR A TURBINE TEST ON
                           APRIL 7, THE FGD SYSTEM HAS OPERATED CONTINUOUSLY WITH NO PROBLEMS.

 5/80  SYSTEM     100.0        100.0       100.0        90.3                    744   672    672

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           THE FGD SYSTEM OPERATED CONTINOUSLY WITH NO PROBLEMS.  A THREE DAY
                           SHUTDOWN FOR INSPECTION OF THE SCR UNIT FROM MAY 16 TO MAY 19 WAS THE
                           ONLY DOWN TIME EXPERIENCED DURING MAY.

 6/80  SYSTEM     100.0        100.0       100.0       100.0                    720   720    720  99.4

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           THE FGD SYSTEM OPERATED CONTINOUSLY WITH NO PROBLEMS DURING JUNE.

 7/80  SYSTEM     100.0        100.0       100.0       100.0                    744   744    744  98.9

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           THE FGD SYSTEM OPERATED DURING JULY WITH NO PROBLEMS.

 8/80  SYSTEM      88.7         88.7        88.7        88.7                    744   744    660  99.5

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           DURING AUGUST THE FGD SYSTEM WAS SHUT DOWN FOR 84 HOURS DUE TO SOME PLUG-
                           GING IN THE REHEATER.  DURING THIS TIME THE REHEATER WAS WATER WASHED AND
                           THE SOOT BLOWER SYSTEM WAS IMPROVED.

 9/80  SYSTEM      89.0         89.0        89.0        89.0                    720   720    641  97.3

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           DURING SEPTEMBER PROBLEMS WITH PLUGGING IN THE REHEATER RECURRED.  THE
                           TROUBLE WAS CAUSED BY ESP PROBLEMS, BY WHICH A LARGE AMOUNT OF FLYASH
                           WENT INTO THE REHEATER.

10/80  SYSTEM     100.0         97.4       100.0        88.0                    744   673    655  88.5

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           DURING OCTOBER THE BOILER WAS TAKEN OFF LINE FOR THREE DAYS FOR AN
                           INSPECTION OF THE NOX REMOVAL SYSTEM.

11/80  SYSTEM     100.0        100.0       100.0       100.0                    720   720    720  99.4

12/80  SYSTEM     100.0        100.0       100.0       100.0                    744   744    744  99.6

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           NO PROBLEMS WERE ENCOUNTERED DURING THE MONTHS OF NOVEMBER AND DECEMBER.
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SECTION 15
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	ELECTRIC POWER DEVELOPMENT CO	
PLANT NAME	ISOGO	
UNIT NUMBER	1	
CITY	YOKOHAMA	
STATE	JAPAN	
REGULATORY CLASSIFICATION	******	
PARTICULATE EMISSION LIMITATION - NG/J	20.	(.046 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	58.	(.135 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	238	
GROSS UNIT GENERATING CAPACITY - MW	265	
NET UNIT GENERATING CAPACITY W/FGD - MW	238	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	265	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	IHI	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	405.36	(859000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	170.0	(338 F)
STACK HEIGHT - M	122.	(400 FT)
STACK SHELL	STEEL	
STACK TOP DIAMETER - M	3.7	(12.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	25958.	(11160 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11160-11520
AVERAGE ASH CONTENT - %	16.00	
RANGE ASH CONTENT - %	15-17	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	6-8	
AVERAGE SULFUR CONTENT - %	.60	
RANGE SULFUR CONTENT - %	0.2 - 0.6	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
SUPPLIER	TOYO ENGINEERING	
INLET FLUE GAS CAPACITY - CU.M/S	353.2	(748362 ACFM)
INLET FLUE GAS TEMPERATURE - C	150.0	(302 F)
PARTICLE REMOVAL EFFICENCY - %	98.0	
** PARTICLE SCRUBBER		
NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SUPPLIER	IHI-CHEMICO	
DIMENSIONS - FT	43.6 DIA X 101.4 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	2194.1	(34827 GPM)
L/G RATIO - LITER/CU.M	9.4	(70.0 GAL/1000ACF)
PRESSURE DROP - KPA	1.5	(5.9 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	424.6	(899864 ACFM)

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ELECTRIC POWER DEVELOPMENT CO: ISOGO 1 (CONT.)

     INLET GAS TEMPERATURE - C                    170.0       (  338 F)

*** FGD SYSTEM

 ** GENERAL DATA
     SALEABLE PRODUCT/THROWAWAY PRODUCT          SALEABLE PRODUCT
     SO2 REMOVAL MODE                            WET SCRUBBING
     PROCESS TYPE                                LIMESTONE
     SYSTEM SUPPLIER                             IHI - CHEMICO
     DEVELOPMENT LEVEL                           FULL SCALE
     NEW/RETROFIT                                RETROFIT
     UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %   97.00
     UNIT DESIGN SO2 REMOVAL EFFICIENCY - %        95.00
     CURRENT STATUS                                1
     COMMERCIAL START-UP                           3/76
     INITIAL START-UP                             12/75

 ** DESIGN AND OPERATING PARAMETERS

 ** ABSORBER
     NUMBER                                        1
     NUMBER OF SPARES                              0
     GENERIC TYPE                                VENTURI TOWER
     SUPPLIER                                    IHI/CHEMICO
     DIMENSIONS - FT                             43.5 DIA X 76.8 HIGH
     SHELL GENERIC MATERIAL                      CARBON STEEL
     SHELL MATERIAL TRADE NAME/COMMON TYPE       N/A
     LINER GENERIC MATERIAL                      ORGANIC
     LINER MATERIAL TRADE NAME/COMMON TYPE       FLAKEGLASS
     NUMBER OF CONTACTING ZONES                    1
     LIQUID RECIRCULATION RATE - LITER/S          2194.       (34827 GPM)
     L/G RATIO - L/CU.M                              9.4      ( 70.0 GAL/1000 ACF)
     GAS-SIDE PRESSURE DROP - KPA                    1.5      ( 5.9 IN-H2O)
     SUPERFICAL GAS VELOCITY - M/SEC                 3.0      ( 10.0 FT/S)
     INLET GAS FLOW - CU. M/S                     566.28      (1200000 ACFM)
     INLET GAS TEMPERATURE - C                     55.0       (  131 F)

 ** MIST ELIMINATOR
     PRE-MIST ELIMINATOR/MIST ELIMINATOR          MIST ELIMINATOR
     GENERIC TYPE                                 IMPINGEMENT
     SPECIFIC TYPE                                BAFFLE
     TRADE NAME/COMMON TYPE                       CHEVRON VANE
     CONFIGURATION                                HORIZONTAL
     NUMBER OF STAGES                               4
     NUMBER OF PASSES PER STAGE                     4
     PRESSURE DROP - KPA                             .5       ( 2.0 IN-H2O)
     SUPERFICAL GAS VELOCITY - M/S                  3.0       (  9.8 FT/S)
     CONSTRUCTION MATERIAL GENERIC TYPE           PLASTIC

 ** REHEATER
     GENERIC TYPE                                 DIRECT COMBUSTION
     TRADE NAME/COMMON TYPE                       OIL
     TEMPERATURE INCREASE - C                      66.1       (  151 F)
     INLET FLUE GAS TEMPERATURE - C               120.0       (  248 F)

 ** FANS
     NUMBER                                         2
     NUMBER OF SPARES                               0
     FUNCTION                                     BOOSTER
     FLUE GAS FLOW RATE - CU.M/S                  362.14      ( 767400 ACFM)
     FLUE GAS TEMPERATURE - C                     170.0       (  338 F)

 ** FANS
     NUMBER                                         1
     NUMBER OF SPARES                               0
     APPLICATION                                  OXIDATION BLOWER
     FLUE GAS FLOW RATE - CU.M/S                    .86       (    1830 ACFM)
     FLUE GAS TEMPERATURE - C                      10.0       (    50 F)
```

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ELECTRIC POWER DEVELOPMENT CO: ISOGO 1 (CONT.)


 ** TANKS
     SERVICE                                       NUMBER
     -------                                       ------
     OXIDATION TOWER FEED                             1
     RECYCLE                                       ****
     SLURRY                                           1
     THICKENER OVERFLOW                               1
     FILTRATE                                         1
     OXIDATION TOWER                                  1

 ** PUMPS
     SERVICE                                       NUMBER
     -------                                       ------
     SLURRY MAKEUP                                    3
     ABSORBER RECIRCULATION                           8
     OXIDATION TOWER SUPPLY TRANSFER                  2
     FILTRATE                                         2

 ** SOLIDS CONCENTRATING/DEWATERING
     DEVICE                                        CENTRIFUGE
     NUMBER                                         4
     NUMBER OF SPARES                              1
     FEED STREAM CHARACTERISTICS                   18.5% SOLIDS
     OUTLET STREAM CHARACTERISTICS                 90% SOLIDS

 ** SOLIDS CONCENTRATING/DEWATERING
     DEVICE                                        THICKENER
     NUMBER                                         1
     NUMBER OF SPARES                              0
     DIMENSIONS - FT                               20 (DIA) X 10 (DEPTH)
     FEED STREAM CHARACTERISTICS                   8.5% SOLIDS
     OUTLET STREAM CHARACTERISTICS                 18.6% SOLIDS

*** SALEABLE BYPRODUCTS
     NATURE                                        GYPSUM
     FULL LOAD QUANTITY - M T/H                        4.53       (   5.00 TPH)
     DISPOSITION                                   MARKETED

*** SLUDGE

 ** TREATMENT
     METHOD                                        FORCED OXIDATION

 ** PROCESS CONTROL AND INSTRUMENTATION
     CHEMICAL PARAMETERS                           PH
     PROCESS CONTROL MANNER                        AUTOMATIC
     PROCESS CHEMISTRY MODE                        FEEDBACK

 ** WATER BALANCE
     WATER LOOP TYPE                               OPEN
     POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S     40
     MAKEUP WATER ADDITION - LITERS/S                 22.3        (   354 GPM)


--------- ------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL  PER  BOILER  FGD  CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 4/78  SYSTEM                                                             720

 5/78  SYSTEM                                                             744

 6/78  SYSTEM                                                             720

 7/78  SYSTEM                                                             744
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ELECTRIC POWER DEVELOPMENT CO: ISOGO 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/78	SYSTEM							744			
9/78	SYSTEM							720			
10/78	SYSTEM							744			
11/78	SYSTEM							720			
12/78	SYSTEM							744			
1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

100% AVAILABILITY FOR THE FGD SYSTEM WAS REPORTED DURING THE PERIOD APRIL 1978 THROUGH MARCH 1979. THE SYSTEM SO2 REMOVAL EFFICIENCY WAS REPORTEDLY AVERAGING 95%.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM							720			
5/79	SYSTEM							744			
6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE APRIL 1979 THROUGH MARCH 1980 PERIOD.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM OPERATED ALONG WITH THE BOILER FOR THE ENTIRE MONTH OF APRIL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/80	SYSTEM	100.0	100.0	100.0	52.8			744	393	393	
6/80	SYSTEM	100.0	100.0	100.0	10.0			720	72	72	

ELECTRIC POWER DEVELOPMENT CO: ISOGO 1 (CONT.)

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-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                                THE BOILER WAS SHUT DOWN FROM MAY 17 TO JUNE 27 FOR ANNUAL MAINTEN-
                                ANCE.  THE FGD SYSTEM WAS OPERATED DURING ALL OF THE BOILER OPERATION
                                IN MAY AND JUNE.

 7/80  SYSTEM     100.0        100.0       100.0       100.0    95.30         744   744    744  90.9

 8/80  SYSTEM     100.0        100.0       100.0       100.0    95.70         744   744    744  91.9

 9/80  SYSTEM     100.0        100.0       100.0        99.8    96.20         720   718    718  90.4

       ** PROBLEMS/SOLUTIONS/COMMENTS

                                DURING SEPTEMBER THE BOILER WAS OUT OF SERVICE FOR APPROXIMATELY TWO HOURS
                                TO CHANGE THE TAP ON THE MAIN TRANSFORMER.

10/80  SYSTEM     100.0        100.0       100.0        91.4    96.00         744   680    680  84.5

11/80  SYSTEM     100.0        100.0       100.0       100.0    95.50         720   720    720  91.7

12/80  SYSTEM     100.0        100.0       100.0       100.0    95.00         744   744    744  93.2

       ** PROBLEMS/SOLUTIONS/COMMENTS

                                DURING JULY THROUGH DECEMBER THE FGD SYSTEM EXPERIENCED NO OPERATIONAL
                                PROBLEMS.
```

SECTION 15
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

COMPANY NAME	ELECTRIC POWER DEVELOPMENT CO	
PLANT NAME	ISOGO	
UNIT NUMBER	2	
CITY	YOKOHAMA	
STATE	JAPAN	
REGULATORY CLASSIFICATION	******	
PARTICULATE EMISSION LIMITATION - NG/J	20.	(.046 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	58.	(.135 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	238	
GROSS UNIT GENERATING CAPACITY - MW	265	
NET UNIT GENERATING CAPACITY W/FGD - MW	238	
NET UNIT GENERATING CAPACITY WO/FGD - MW	246	
EQUIVALENT SCRUBBED CAPACITY - MW	265	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	IHI	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	405.36	(859000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	170.0	(338 F)
STACK HEIGHT - M	140.	(460 FT)
STACK SHELL	STEEL	
STACK TOP DIAMETER - M	3.7	(12.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	25958.	(11160 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11160-11520
AVERAGE ASH CONTENT - %	16.00	
RANGE ASH CONTENT - %	15-17	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	6-8	
AVERAGE SULFUR CONTENT - %	.60	
RANGE SULFUR CONTENT - %	0.2 - 0.6	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
INLET FLUE GAS CAPACITY - CU.M/S	356.6	(755654 ACFM)
INLET FLUE GAS TEMPERATURE - C	150.0	(302 F)
PARTICLE REMOVAL EFFICENCY - %	98.0	
** PARTICLE SCRUBBER		
NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SUPPLIER	IHI-CHEMICO	
DIMENSIONS - FT	43.6 DIA X 101.4 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	2194.1	(34827 GPM)
L/G RATIO - LITER/CU.M	9.4	(70.0 GAL/1000ACF)
PRESSURE DROP - KPA	1.5	(5.9 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	424.6	(899864 ACFM)
INLET GAS TEMPERATURE - C	170.0	(338 F)

```
*** FGD SYSTEM

 ** GENERAL DATA
     SALEABLE PRODUCT/THROWAWAY PRODUCT        SALEABLE PRODUCT
     SO2 REMOVAL MODE                          WET SCRUBBING
     PROCESS TYPE                              LIMESTONE
     SYSTEM SUPPLIER                           IHI - CHEMICO
     DEVELOPMENT LEVEL                         FULL SCALE
     NEW/RETROFIT                              RETROFIT
     UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %   97.00
     UNIT DESIGN SO2 REMOVAL EFFICIENCY - %        95.00
     CURRENT STATUS                             1
     COMMERCIAL START-UP                        5/76
     INITIAL START-UP                           3/76

 ** DESIGN AND OPERATING PARAMETERS

 ** ABSORBER
     NUMBER                                     1
     NUMBER OF SPARES                           0
     GENERIC TYPE                              VENTURI TOWER
     SUPPLIER                                  IHI/CHEMICO
     DIMENSIONS - FT                           43.5 DIA X 76.8 HIGH
     SHELL GENERIC MATERIAL                    CARBON STEEL
     SHELL MATERIAL TRADE NAME/COMMON TYPE     N/A
     LINER GENERIC MATERIAL                    ORGANIC
     LINER MATERIAL TRADE NAME/COMMON TYPE     FLAKEGLASS
     NUMBER OF CONTACTING ZONES                 1
     LIQUID RECIRCULATION RATE - LITER/S        2194.        (34827 GPM)
     L/G RATIO - L/CU.M                            9.4       ( 70.0 GAL/1000 ACF)
     GAS-SIDE PRESSURE DROP - KPA                  1.5       ( 5.9 IN-H2O)
     SUPERFICAL GAS VELOCITY - M/SEC               3.0       ( 10.0 FT/S)
     INLET GAS FLOW - CU. M/S                    566.28      (1200000 ACFM)
     INLET GAS TEMPERATURE - C                    55.0       (  131 F)

 ** MIST ELIMINATOR
     PRE-MIST ELIMINATOR/MIST ELIMINATOR       MIST ELIMINATOR
     GENERIC TYPE                              IMPINGEMENT
     SPECIFIC TYPE                             BAFFLE
     TRADE NAME/COMMON TYPE                    CHEVRON VANE
     CONFIGURATION                             HORIZONTAL
     NUMBER OF STAGES                              4
     NUMBER OF PASSES PER STAGE                    4
     PRESSURE DROP - KPA                          .5         ( 2.0 IN-H2O)
     SUPERFICAL GAS VELOCITY - M/S                3.0        (  9.8 FT/S)
     CONSTRUCTION MATERIAL GENERIC TYPE        PLASTIC

 ** REHEATER
     GENERIC TYPE                              DIRECT COMBUSTION
     TRADE NAME/COMMON TYPE                    OIL
     TEMPERATURE INCREASE - C                     66.1       (  151 F)
     INLET FLUE GAS FLOW RATE - CU. M/S          132.50      ( 280783 ACFM)
     INLET FLUE GAS TEMPERATURE - C              120.0       (  248 F)

 ** FANS
     NUMBER                                     2
     NUMBER OF SPARES                           0
     FUNCTION                                  BOOSTER
     FLUE GAS FLOW RATE - CU.M/S                 362.14      ( 767400 ACFM)
     FLUE GAS TEMPERATURE - C                    170.0       (  338 F)

 ** FANS
     NUMBER                                     1
     NUMBER OF SPARES                           0
     APPLICATION                               OXIDATION BLOWER
     FLUE GAS FLOW RATE - CU.M/S                  .86        (    1830 ACFM)
     FLUE GAS TEMPERATURE - C                    10.0        (    50 F)
```

** TANKS

SERVICE	NUMBER
OXIDATION TOWER FEED	1
SLURRY	1
THICKENER OVERFLOW	1
FILTRATE	1
OXIDATION TOWER	1

** PUMPS

SERVICE	NUMBER
SLURRY MAKEUP	2
ABSORBER RECIRCULATION	8
OXIDATION TOWER SUPPLY TRANSFER	2
FILTRATE	2

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	4
NUMBER OF SPARES	0
FEED STREAM CHARACTERISTICS	18.5% SOLIDS
OUTLET STREAM CHARACTERISTICS	90% SOLIDS

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	20 (DIA) X 10 (DEPTH)
FEED STREAM CHARACTERISTICS	8.5% SOLIDS
OUTLET STREAM CHARACTERISTICS	18.6% SOLIDS

*** SALEABLE BYPRODUCTS

NATURE	GYPSUM	
FULL LOAD QUANTITY - M T/H	4.53	(5.00 TPH)
DISPOSITION	MARKETED	

*** SLUDGE

** TREATMENT

METHOD	FORCED OXIDATION

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	OPEN	
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	40	
MAKEUP WATER ADDITION - LITERS/S	22.3	(354 GPM)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/78	SYSTEM							720			
5/78	SYSTEM							744			
6/78	SYSTEM							720			
7/78	SYSTEM							744			

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/78	SYSTEM							744			
9/78	SYSTEM							720			
10/78	SYSTEM							744			
11/78	SYSTEM							720			
12/78	SYSTEM							744			
1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

100% AVAILABILITY FOR THE FGD SYSTEM WAS REPORTED DURING THE PERIOD APRIL 1978 THROUGH MARCH 1979. THE FGD SYSTEM LOGGED A TOTAL OF 1,689 HOURS OF OPERATION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM							720			
5/79	SYSTEM							744			
6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE APRIL 1979 THROUGH MARCH 1980 PERIOD.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM	100.0	100.0	100.0	31.3			720	225	225	

** PROBLEMS/SOLUTIONS/COMMENTS

ON MARCH 30 THE BOILER WAS SHUTDOWN FOR ANNUAL MAINTENANCE. THE UNIT REMAINED DOWN THROUGH APRIL 20. WHEN OPERATIONS COMMENCED THE FGD SYSTEM OPERATED WITH THE BOILER FOR THE REST OF THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
6/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	

ELECTRIC POWER DEVELOPMENT CO: ISOGO 2 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY AND JUNE THE FGD SYSTEM OPERATED WITH NO REPORTED PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	SYSTEM	100.0	100.0	100.0	88.2	94.90		744	656	656	82.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY THE BOILER WAS OFF LINE APPROXIMATELY 88 HOURS FOR MAINTENANCE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/80	SYSTEM	100.0	100.0	100.0	100.0	96.00		744	744	744	91.9
9/80	SYSTEM	100.0	100.0	100.0	99.8	95.70		720	718	718	92.1

** PROBLEMS/SOLUTIONS/COMMENTS

APPROXIMATELY TWO HOURS OF BOILER OUTAGE TIME WAS NECESSARY TO CHANGE THE TAP OF THE MAIN TRANSFORMER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM	100.0	100.0	100.0	100.0	95.30		744	744	744	92.2
11/80	SYSTEM	100.0	100.0	100.0	100.0	95.20		720	720	720	92.7
12/80	SYSTEM	100.0	100.0	100.0	100.0	95.00		744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY THROUGH DECEMBER THE FGD SYSTEM OPERATED WITH NO PROBLEMS.

SECTION 15
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

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COMPANY NAME                                  ELECTRIC POWER DEVELOPMENT CO
PLANT NAME                                    TAKASAGO
UNIT NUMBER                                   1
CITY                                          TAKASAGO
STATE                                         JAPAN
REGULATORY CLASSIFICATION                     ******
PARTICULATE EMISSION LIMITATION - NG/J           37.          (  .086 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  150.          (  .350 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                ******          (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              230
GROSS UNIT GENERATING CAPACITY - MW             250
NET UNIT GENERATING CAPACITY W/FGD - MW         230
NET UNIT GENERATING CAPACITY WO/FGD - MW        238
EQUIVALENT SCRUBBED CAPACITY - MW               250

 ** UNIT DATA - BOILER AND STACK
    BOILER SUPPLIER                           MITSUBISHI HEAVY INDUSTRIES
    BOILER TYPE                               ******
    BOILER SERVICE LOAD                       BASE
    DESIGN BOILER FLUE GAS FLOW - CU.M/S        365.25        ( 774000 ACFM)
    BOILER FLUE GAS TEMPERATURE - C             154.4         ( 310 F)
    STACK HEIGHT - M                            180.          ( 590 FT)
    STACK SHELL                               STEEL
    STACK TOP DIAMETER - M                        3.6         ( 11.9 FT)

 ** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                ******
    AVERAGE HEAT CONTENT - J/G                25958.          ( 11160 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                 11160-11520
    AVERAGE ASH CONTENT - %                      22.00
    RANGE ASH CONTENT - %                     ******
    AVERAGE MOISTURE CONTENT - %                  7.00
    RANGE MOISTURE CONTENT - %                ******
    AVERAGE SULFUR CONTENT - %                    1.80
    RANGE SULFUR CONTENT - %                  ******
    AVERAGE CHLORIDE CONTENT - %              ********
    RANGE CHLORIDE CONTENT - %                ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
    NUMBER                                    0
    TYPE                                      NONE

 ** ESP
    NUMBER                                    1
    TYPE                                      COLD SIDE
    SUPPLIER                                  MITSUBISHI HEAVY INDUSTRIES
    INLET FLUE GAS CAPACITY - CU.M/S            344.3         ( 729507 ACFM)
    INLET FLUE GAS TEMPERATURE - C              154.4         (  310 F)
    PARTICLE REMOVAL EFFICENCY - %               99.5

 ** PARTICLE SCRUBBER
    NUMBER                                    1
    NUMBER OF SPARES                          0
    GENERIC TYPE                              VENTURI TOWER
    SUPPLIER                                  MITSUI-CHEMICO
    DIMENSIONS - FT                           37.7 DIA X 62.3 HIGH
    SHELL GENERIC MATERIAL                    CARBON STEEL
    SHELL SPECIFIC MATERIAL                   AISI 1110
    LINER GENERIC MATERIAL                    CORRISION RESISTANT
    NUMBER OF CONTACTING ZONES                1
    LIQUID RECIRCULATION RATE - LITER/S        1228.8         (19505 GPM)
    L/G RATIO - LITER/CU.M                        6.5         (48.6 GAL/1000ACF)
    PRESSURE DROP - KPA                           1.5         ( 5.9 IN-H2O)
    INLET GAS FLOW RATE - CU.M/S                260.5         ( 552000 ACFM)
    INLET GAS TEMPERATURE - C                   154.4         (  310 F)
    SO2 REMOVAL EFFICENCY - %                    56.0
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ELECTRIC POWER DEVELOPMENT CO: TAKASAGO 1 (CONT.)

PARTICLE REMOVAL EFFICIENCY - %	50.0	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	MITSUI - CHEMICO
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	93.00
CURRENT STATUS	1
INITIAL START-UP	2/75

** DESIGN AND OPERATING PARAMETERS

#### ** ABSORBER

NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SUPPLIER	MITSUI/CHEMICO	
DIMENSIONS - FT	45.0 DIA X 78.7 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	2566.	(40727 GPM)
L/G RATIO - L/CU.M	6.5	(48.6 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(5.9 IN-H2O)
INLET GAS TEMPERATURE - C	55.0	(131 F)
SO2 REMOVAL EFFICIENCY - %	85.0	

#### ** ABSORBER

NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SUPPLIER	MITSUI/CHEMICO	
DIMENSIONS - FT	26.2 DIA X 82.3 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	610.	(9689 GPM)
INLET GAS FLOW - CU. M/S	69.37	(147000 ACFM)
INLET GAS TEMPERATURE - C	154.4	(310 F)
SO2 REMOVAL EFFICIENCY - %	63.0	

#### ** ABSORBER

NUMBER	2	
GENERIC TYPE	SPRAY TOWER	
SUPPLIER	MITSUI/CHEMICO	
DIMENSIONS - FT	19.7 DIA X 65.0 HIGH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	9986.	(***** GPM)
INLET GAS FLOW - CU. M/S	18.26	(38686 ACFM)
INLET GAS TEMPERATURE - C	154.4	(310 F)

#### ** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE
NUMBER OF STAGES	4
NUMBER OF PASSES PER STAGE	4

** REHEATER

NUMBER	1	
GENERIC TYPE	DIRECT COMBUSTION	
TRADE NAME/COMMON TYPE	OIL	
INLET FLUE GAS TEMPERATURE - C	120.0	(248 F)

ELECTRIC POWER DEVELOPMENT CO: TAKASAGO 1 (CONT.)

** FANS

FUNCTION	BOOSTER

** FANS

APPLICATION	OXIDATION BLOWER

** TANKS

SERVICE	NUMBER
CENTRIFUGE OVERFLOW	2
ABSORBENT MAKEUP	1
CENTRIFUGE FEED	1
PRIMARY LIQUOR	1
ABSORBER FEED	1

** PUMPS

SERVICE	NUMBER
CIRCULATION	5
PH ADJUSTER CIRCULATION	3
REACTOR CIRCULATION	3

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	7
OUTLET STREAM CHARACTERISTICS	90% SOLIDS

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
OUTLET STREAM CHARACTERISTICS	20% SOLIDS

*** SALEABLE BYPRODUCTS

NATURE	GYPSUM	
FULL LOAD QUANTITY - M T/H	8.62	(9.50 TPH)

*** SLUDGE

** TREATMENT

METHOD	FORCED OXIDATION

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	FLUE GAS VOLUME & SO2 CONCENTRATION

** WATER BALANCE

WATER LOOP TYPE	OPEN	
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	40	
MAKEUP WATER ADDITION - LITERS/S	13.1	(208 GPM)

-----PERFORMANCE DATA-----

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/75	SYSTEM		96.9		88.8			672	616	597	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN ONCE DUE TO A PIPING FLANGE LEAK.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/75	SYSTEM		100.0		48.4			744	360	360	
4/75	SYSTEM		100.0		44.1			720	318	318	

ELECTRIC POWER DEVELOPMENT CO: TAKASAGO 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE BOILER WAS TAKEN OFF-LINE FOR ANNUAL MAINTENANCE DURING MARCH AND APRIL.								
5/75	SYSTEM		100.0		96.4			744	717	717	
6/75	SYSTEM		97.9		97.9			720	720	705	
7/75	SYSTEM		98.0		97.8			744	743	728	
8/75	SYSTEM		98.0		98.0			744	744	729	
9/75	SYSTEM		95.7		91.7			720	690	660	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			SYSTEM DOWN TIME FROM JUNE THROUGH SEPTEMBER WAS DUE TO MIST ELIMINATOR SCALING.								
10/75	SYSTEM		95.2		95.2			744	744	708	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			FAN VIBRATIONS CAUSED A SYSTEM OUTAGE DURING THE MONTH.								
11/75	SYSTEM		98.5		98.5			720	720	709	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			MIST ELIMINATOR SCALING WAS ENCOUNTERED IN NOVEMBER.								
12/75	SYSTEM		95.9		92.2			744	715	686	
1/76	SYSTEM		100.0		100.0			744	744	744	
2/76	SYSTEM		95.2		90.8			696	664	632	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			DURING FEBRUARY, THE SYSTEM AGAIN ENCOUNTERED MIST ELIMINATOR SCALING.								
3/76	SYSTEM		100.0		92.3			744	687	687	
4/76	SYSTEM		100.0		30.4			720	219	219	
5/76	SYSTEM		100.0		100.0			744	744	744	
6/76	SYSTEM		100.0		100.0			720	720	720	
7/76	SYSTEM		100.0		100.0			744	744	744	
8/76	SYSTEM							744	744		
9/76	SYSTEM		100.0		100.0			720	720	720	
10/76	SYSTEM		91.7		91.7			744	744	682	
	** PROBLEMS/SOLUTIONS/COMMENTS										
			THE SYSTEM WAS TAKEN OFF-LINE FOR CLEANING OF THE FIRST STAGE SCRUBBER.								
11/76	SYSTEM		99.3		99.3			720	720	715	

ELECTRIC POWER DEVELOPMENT CO: TAKASAGO 1 (CONT.)

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-----------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          REPAIR OF A DUCT FORCED ONE SYSTEM OUTAGE DURING THE MONTH.

12/76  SYSTEM       98.9                            98.9                   744   744    736

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          A DECEMBER OUTAGE WAS DUE TO THE REPAIR OF A SPRAY PIPE.

 1/77  SYSTEM       99.3                            99.3                   744   744    739

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          THE SYSTEM WAS TAKEN OFF-LINE ONCE FOR CLEANING OF THE FIRST STAGE
                          SCRUBBER.

 2/77  SYSTEM      100.0                           100.0                   672   672    672

 3/77  SYSTEM                                         .0                   744     0      0

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          THE SYSTEM WAS OFF DURING MARCH FOR ANNUAL BOILER MAINTENANCE.

 4/77  SYSTEM      100.0                            71.3                   720   513    513

 5/77  SYSTEM       98.7                            98.7                   744   744    734

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          FAN VIBRATIONS CAUSED ONE SYSTEM OUTAGE DURING MAY.

 6/77  SYSTEM      100.0                           100.0                   720   720    720

 7/77  SYSTEM      100.0                            96.4                   744   717    717

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          THE FIRST STAGE ABSORBER WAS CLEANED DURING JULY.

 8/77  SYSTEM      100.0                           100.0                   744   744    744

 9/77  SYSTEM      100.0                           100.0                   720   720    720

10/77  SYSTEM       94.2                            94.2                   744   744    701

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          THE SYSTEM WAS OFF LINE PART OF THIS MONTH FOR CLEANING OF THE SCRUBBERS
                          AND REACTORS.

11/77  SYSTEM      100.0                           100.0                   720   720    720

12/77  SYSTEM      100.0                           100.0                   744   744    744

 1/78  SYSTEM      100.0                           100.0                   744   744    744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          THE FIRST REACTOR WAS CLEANED THIS MONTH.

 4/78  SYSTEM                                                              720
```

ELECTRIC POWER DEVELOPMENT CO: TAKASAGO 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/78	SYSTEM							744			
6/78	SYSTEM							720			
7/78	SYSTEM							744			
8/78	SYSTEM							744			
9/78	SYSTEM							720			
10/78	SYSTEM							744			
11/78	SYSTEM							720			
12/78	SYSTEM							744			
1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL 1978 THROUGH MARCH 1979 NO FORCED OUTAGES OCCURRED. THE FGD SYSTEM AVAILABILITY WAS 99.9%, AND LOGGED A TOTAL OF 7823.4 HOURS OF OPERATION WITH 6.1 HOURS OF SCHEDULED OUTAGE TIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM							720			
6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE APRIL 1979 THROUGH MARCH 1980 PERIOD.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM	100.0	100.0	100.0	31.1			720	224	224	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUTDOWN ON MARCH 29 FOR ANNUAL MAINTENANCE. THE UNIT REMAINED OFF LINE THROUGH APRIL 21. WHEN OPERATIONS COMMENCED THE FGD SYSTEM OPERATED WITH THE BOILER FOR THE REST OF THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	

ELECTRIC POWER DEVELOPMENT CO: TAKASAGO 1 (CONT.)

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------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 6/80  SYSTEM     100.0       100.0       100.0       100.0                  720    720    720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE FGD SYSTEM EXPERIENCED NO PROBLEMS DURING THE MAY-JUNE PERIOD.

 7/80  SYSTEM     100.0       100.0       100.0       100.0    93.00         744    744    744  83.4

 8/80  SYSTEM     100.0       100.0       100.0       100.0    92.80         744    744    744  83.6

 9/80  SYSTEM     100.0       100.0       100.0       100.0    93.00         720    720    720  83.3

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         NO PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER 1980.

10/80  SYSTEM      99.5        99.5        99.5        99.5    92.70         744    744    740  85.3

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE FGD SYSTEM WAS SHUT DOWN FOR APPROXIMATELY FOUR HOURS IN OCTOBER FOR
                         AN INSPECTION OF THE SECOND SCRUBBER OUTLET DUCT AND THE MIST ELIMINATOR.
                         THE INSPECTION REVEALED THAT NO PROBLEM EXISTED.

11/80  SYSTEM     100.0       100.0       100.0       100.0    92.70         720    720    720  85.0

12/80  SYSTEM     100.0       100.0       100.0       100.0    92.70         744    744    744  89.9

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         NO PROBLEMS WERE ENCOUNTERED DURING NOVEMBER AND DECEMBER.
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COMPANY NAME                                    ELECTRIC POWER DEVELOPMENT CO
PLANT NAME                                      TAKASAGO
UNIT NUMBER                                     2
CITY                                            TAKASAGO
STATE                                           JAPAN
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J            37.         (  .086 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                   150.         (  .350 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                  ******        (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW               230
GROSS UNIT GENERATING CAPACITY - MW              250
NET UNIT GENERATING CAPACITY W/FGD - MW          230
NET UNIT GENERATING CAPACITY WO/FGD - MW         238
EQUIVALENT SCRUBBED CAPACITY - MW                250

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                            MITSUBISHI HEAVY INDUSTRIES
     BOILER TYPE                                ******
     BOILER SERVICE LOAD                        BASE
     DESIGN BOILER FLUE GAS FLOW - CU.M/S         365.25      ( 774000 ACFM)
     BOILER FLUE GAS TEMPERATURE - C              154.4       ( 310 F)
     STACK HEIGHT - M                             180.        ( 590 FT)
     STACK SHELL                                STEEL
     STACK TOP DIAMETER - M                         3.6       ( 11.9 FT)

 ** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 ******
     AVERAGE HEAT CONTENT - J/G                 25958.        ( 11160 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                11160-11520
     AVERAGE ASH CONTENT - %                       22.00
     RANGE ASH CONTENT - %                      ******
     AVERAGE MOISTURE CONTENT - %                   7.00
     RANGE MOISTURE CONTENT - %                 ******
     AVERAGE SULFUR CONTENT - %                     1.80
     RANGE SULFUR CONTENT - %                   ******
     AVERAGE CHLORIDE CONTENT - %               ********
     RANGE CHLORIDE CONTENT - %                 ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
     NUMBER                                       0
     TYPE                                       NONE

 ** ESP
     NUMBER                                       1
     TYPE                                       COLD SIDE
     SUPPLIER                                   MITSUBISHI HEAVY INDUSTRIES
     INLET FLUE GAS CAPACITY - CU.M/S             344.3       ( 729507 ACFM)
     INLET FLUE GAS TEMPERATURE - C               154.4       (  310 F)
     PARTICLE REMOVAL EFFICENCY - %                99.5

 ** PARTICLE SCRUBBER
     NUMBER                                       1
     NUMBER OF SPARES                             0
     GENERIC TYPE                               VENTURI TOWER
     SUPPLIER                                   MITSUI-CHEMICO
     DIMENSIONS - FT                            37.7 DIA X 62.3 HIGH
     SHELL GENERIC MATERIAL                     CARBON STEEL
     SHELL SPECIFIC MATERIAL                    AISI 1110
     LINER GENERIC MATERIAL                     CORRISION RESISTANT
     NUMBER OF CONTACTING ZONES                   1
     LIQUID RECIRCULATION RATE - LITER/S         1542.2       (24480 GPM)
     L/G RATIO - LITER/CU.M                         6.5       (48.6 GAL/1000ACF)
     PRESSURE DROP - KPA                            1.5       ( 5.9 IN-H2O)
     INLET GAS FLOW RATE - CU.M/S                 260.5       ( 552000 ACFM)
     INLET GAS TEMPERATURE - C                    154.4       (  310 F)
     SO2 REMOVAL EFFICENCY - %                     56.0
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ELECTRIC POWER DEVELOPMENT CO: TAKASAGO 2 (CONT.)

    PARTICLE REMOVAL EFFICIENCY - %              50.0

*** FGD SYSTEM

 ** GENERAL DATA
    SALEABLE PRODUCT/THROWAWAY PRODUCT        SALEABLE PRODUCT
    SO2 REMOVAL MODE                          WET SCRUBBING
    PROCESS TYPE                              LIMESTONE
    SYSTEM SUPPLIER                           MITSUI - CHEMICO
    DEVELOPMENT LEVEL                         FULL SCALE
    NEW/RETROFIT                              RETROFIT
    UNIT DESIGN SO2 REMOVAL EFFICIENCY - %      93.00
    CURRENT STATUS                            1
    INITIAL START-UP                          3/76

 ** DESIGN AND OPERATING PARAMETERS

 ** ABSORBER
    NUMBER                                    1
    NUMBER OF SPARES                          0
    GENERIC TYPE                              VENTURI TOWER
    SUPPLIER                                  MITSUI/CHEMICO
    DIMENSIONS - FT                           45.0 DIA X 78.7 HIGH
    SHELL GENERIC MATERIAL                    CARBON STEEL
    SHELL MATERIAL TRADE NAME/COMMON TYPE     N/A
    NUMBER OF CONTACTING ZONES                1
    LIQUID RECIRCULATION RATE - LITER/S        2066.         (32801 GPM)
    L/G RATIO - L/CU.M                           6.5         ( 48.6 GAL/1000 ACFM)
    GAS-SIDE PRESSURE DROP - KPA                 1.5         ( 5.9 IN-H2O)
    INLET GAS FLOW - CU. M/S                   280.24        ( 593855 ACFM)
    INLET GAS TEMPERATURE - C                   55.0         (  131 F)
    SO2 REMOVAL EFFICIENCY - %                  85.0

 ** ABSORBER
    NUMBER                                    1
    GENERIC TYPE                              VENTURI TOWER
    SUPPLIER                                  MITSUI/CHEMICO
    DIMENSIONS - FT                           26.2 DIA X 82.3 HIGH
    SHELL GENERIC MATERIAL                    CARBON STEEL
    SHELL MATERIAL TRADE NAME/COMMON TYPE     N/A
    NUMBER OF CONTACTING ZONES                1
    LIQUID RECIRCULATION RATE - LITER/S         743.         (11799 GPM)
    INLET GAS FLOW - CU. M/S                    69.37        ( 147000 ACFM)
    INLET GAS TEMPERATURE - C                  154.4         (  310 F)
    SO2 REMOVAL EFFICIENCY - %                  63.0

 ** ABSORBER
    NUMBER                                    1
    GENERIC TYPE                              SPRAY TOWER
    SUPPLIER                                  MITSUI/CHEMICO
    SHELL GENERIC MATERIAL                    CARBON STEEL
    SHELL MATERIAL TRADE NAME/COMMON TYPE     N/A
    NUMBER OF CONTACTING ZONES                1
    LIQUID RECIRCULATION RATE - LITER/S       19639.         (***** GPM)
    INLET GAS FLOW - CU. M/S                    36.51        (  77372 ACFM)
    INLET GAS TEMPERATURE - C                  154.4         (  310 F)

 ** MIST ELIMINATOR
    PRE-MIST ELIMINATOR/MIST ELIMINATOR       MIST ELIMINATOR
    GENERIC TYPE                              IMPINGEMENT
    SPECIFIC TYPE                             BAFFLE
    TRADE NAME/COMMON TYPE                    CHEVRON VANE
    NUMBER OF STAGES                             4
    NUMBER OF PASSES PER STAGE                   4

 ** REHEATER
    NUMBER                                    1
    GENERIC TYPE                              DIRECT COMBUSTION
    TRADE NAME/COMMON TYPE                    OIL
    INLET FLUE GAS TEMPERATURE - C             120.0         (  248 F)
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ELECTRIC POWER DEVELOPMENT CO: TAKASAGO 2 (CONT.)

** FANS
FUNCTION — BOOSTER

** FANS
APPLICATION — OXIDATION BLOWER

** TANKS

SERVICE	NUMBER
CENTRIFUGE OVERFLOW	2
ABSORBENT MAKEUP	1
CENTRIFUGE FEED	1
PRIMARY LIQUOR	1
ABSORBER FEED	1

** PUMPS

SERVICE	NUMBER
CIRCULATION	5
PH ADJUSTER CIRCULATION	2
REACTOR CIRCULATION	1

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	7
OUTLET STREAM CHARACTERISTICS	90% SOLIDS

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
OUTLET STREAM CHARACTERISTICS	20% SOLIDS

*** SALEABLE BYPRODUCTS

NATURE	GYPSUM	
FULL LOAD QUANTITY - M T/H	8.62	(9.50 TPH)

*** SLUDGE

** PROCESS CONTROL AND INSTRUMENTATION
CHEMICAL PARAMETERS — FLUE GAS VOLUME & SO2 CONCENTRATION

** WATER BALANCE

WATER LOOP TYPE	OPEN	
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	40	
MAKEUP WATER ADDITION - LITERS/S	13.1	(208 GPM)

-----PERFORMANCE DATA-----

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/76	SYSTEM		100.0		100.0			744	744	720	
4/76	SYSTEM		100.0		100.0			720	720	720	
5/76	SYSTEM		100.0		29.0			744	216	216	
6/76	SYSTEM		100.0		87.8			720	632	632	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS DOWN FOR PART OF MAY AND JUNE FOR ANNUAL BOILER MAINTENANCE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/76	SYSTEM		100.0		100.0			744	744	744	
8/76	SYSTEM		100.0		100.0			744	744	744	

ELECTRIC POWER DEVELOPMENT CO: TAKASAGO 2 (CONT.)

PERFORMANCE DATA											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/76	SYSTEM		100.0		100.0			720	720	720	
10/76	SYSTEM		94.2		94.2			744	744	701	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	OUTAGE TIME DURING OCTOBER WAS NECESSARY FOR DUCT CLEANING.										
11/76	SYSTEM		100.0		100.0			720	720	720	
12/76	SYSTEM		99.3		99.3			744	744	739	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE SYSTEM WAS DOWN BRIEFLY FOR REPAIR OF A GYPSUM CONVEYOR.										
1/77	SYSTEM		100.0		100.0			744	744	744	
2/77	SYSTEM		88.2		88.2			672	672	593	
3/77	SYSTEM		98.7		98.7			744	744	734	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	OUTAGE TIME IN FEBRUARY & MARCH WAS NEEDED FOR CLEANING OF A PH CONTROLLER.										
4/77	SYSTEM		100.0		100.0			720	720	720	
5/77	SYSTEM		100.0		51.6			744	384	384	
6/77	SYSTEM		100.0		3.3			720	240	240	
7/77	SYSTEM		100.0		100.0			744	744	744	
8/77	SYSTEM		100.0		100.0			744	744	744	
9/77	SYSTEM		100.0		100.0			720	720	720	
10/77	SYSTEM		100.0		100.0			744	744	744	
11/77	SYSTEM		89.2		89.2			720	720	642	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	CLEANING OF THE PH CONTROLLER CAUSED ONE OUTAGE DURING NOVEMBER. A REACTOR WAS ALSO CLEANED THIS MONTH.										
12/77	SYSTEM		100.0		100.0			744	744	744	
1/78	SYSTEM							744	744		
2/78	SYSTEM							672			
3/78	SYSTEM							720			
4/78	SYSTEM							720			
5/78	SYSTEM							744			
6/78	SYSTEM							720			
7/78	SYSTEM							744			

ELECTRIC POWER DEVELOPMENT CO: TAKASAGO 2 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/78	SYSTEM							744			
9/78	SYSTEM							720			
10/78	SYSTEM							744			
11/78	SYSTEM							720			
12/78	SYSTEM							744			
1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD FROM APRIL 1978 THROUGH MARCH 1979 THE FGD SYSTEM OPERATED WITH 99.8% AVAILABILITY. THERE WERE NO FORCED OUTAGES DURING THIS TIME. A TOTAL OF 8147.4 HOURS OF FGD SYSTEM OPERATION WERE LOGGED WITH 19.5 HOURS OF SCHEDULED OUTAGE TIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM							720			
5/79	SYSTEM							744			
6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE APRIL 1979 THROUGH MARCH 1980 PERIOD.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
5/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL AND MAY THE UTILITY EXPERIENCED NO PROBLEMS WITH THE FGD SYSTEM.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/80	SYSTEM	100.0	100.0	100.0	24.6			720	177	177	

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

ELECTRIC POWER DEVELOPMENT CO: TAKASAGO 2 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUTDOWN FROM JUNE 3 TO JUNE 24 FOR ANNUAL MAINTENANCE. THE FGD SYSTEM OPERATED ALONG WITH THE BOILER THE REMAINDER OF THE TIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	SYSTEM	100.0	100.0	100.0	100.0	92.80		744	744	744	83.0
8/80	SYSTEM	100.0	100.0	100.0	100.0	92.80		744	744	744	83.3
9/80	SYSTEM	100.0	100.0	100.0	100.0	93.10		720	720	720	83.4
10/80	SYSTEM	100.0	100.0	100.0	100.0	92.60		744	744	744	85.1
11/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	84.8
12/80	SYSTEM	100.0	100.0	100.0	87.3	92.60		744	649	649	78.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY THROUGH DECEMBER NO FGD-RELATED PROBLEMS WERE EXPERIENCED.

IN DECEMBER THE BOILER WAS OUT OF SERVICE APPROXIMATELY FOUR DAYS FOR GENERAL MAINTENANCE.

SECTION 15
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

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COMPANY NAME                                   ELECTRIC POWER DEVELOPMENT CO
PLANT NAME                                     TAKEHARA
UNIT NUMBER                                    1
CITY                                           MIHARA
STATE                                          JAPAN
REGULATORY CLASSIFICATION                      ******
PARTICULATE EMISSION LIMITATION - NG/J           56.        (   .130 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  271.        (   .630 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                 ******       (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              231
GROSS UNIT GENERATING CAPACITY - MW             250
NET UNIT GENERATING CAPACITY W/FGD - MW         231
NET UNIT GENERATING CAPACITY WO/FGD - MW        239
EQUIVALENT SCRUBBED CAPACITY - MW               250

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                           BABCOCK - HITACHI
     BOILER TYPE                               PULVERIZED COAL
     BOILER SERVICE LOAD                       BASE
     DESIGN BOILER FLUE GAS FLOW - CU.M/S        577.13       (1223000 ACFM)
     BOILER FLUE GAS TEMPERATURE - C             140.0        ( 284 F)
     STACK HEIGHT - M                            201.         ( 660 FT)
     STACK SHELL                               STEEL
     STACK TOP DIAMETER - M                        3.6        ( 11.9 FT)

 ** FUEL DATA
     FUEL TYPE                                 COAL
     FUEL GRADE                                ******
     AVERAGE HEAT CONTENT - J/G                25130.         ( 10804 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                               10804-11520
     AVERAGE ASH CONTENT - %                      23.00
     RANGE ASH CONTENT - %                     ******
     AVERAGE MOISTURE CONTENT - %                  9.05
     RANGE MOISTURE CONTENT - %                ******
     AVERAGE SULFUR CONTENT - %                    2.00
     RANGE SULFUR CONTENT - %                  ******
     AVERAGE CHLORIDE CONTENT - %                   .05
     RANGE CHLORIDE CONTENT - %                ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
     NUMBER                                    0
     TYPE                                      NONE

 ** ESP
     NUMBER                                    1
     TYPE                                      COLD SIDE
     SUPPLIER                                  SUMITOMO HEAVY INDUSTRIES
     INLET FLUE GAS CAPACITY - CU.M/S            333.2        ( 706000 ACFM)
     INLET FLUE GAS TEMPERATURE - C              140.0        (  284 F)
     PARTICLE REMOVAL EFFICENCY - %               98.0

 ** PARTICLE SCRUBBER
     NUMBER                                    2
     GENERIC TYPE                              VENTURI TOWER
     SUPPLIER                                  HITACHI
     LINER GENERIC MATERIAL                    ORGANIC
     NUMBER OF CONTACTING ZONES                1
     LIQUID RECIRCULATION RATE - LITER/S         533.7        ( 8471 GPM)
     L/G RATIO - LITER/CU.M                        2.5        (18.7 GAL/1000ACF)
     PRESSURE DROP - KPA                           2.3        ( 9.1 IN-H2O)
     INLET GAS FLOW RATE - CU.M/S                168.0        ( 356000 ACFM)
     INLET GAS TEMPERATURE - C                   140.0        (  284 F)

*** FGD SYSTEM
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ELECTRIC POWER DEVELOPMENT CO: TAKEHARA 1 (CONT.)

** GENERAL DATA
    SALEABLE PRODUCT/THROWAWAY PRODUCT          SALEABLE PRODUCT
    SO2 REMOVAL MODE                            WET SCRUBBING
    PROCESS TYPE                                LIMESTONE
    PROCESS ADDITIVES                           NONE
    SYSTEM SUPPLIER                             BABCOCK - HITACHI
    DEVELOPMENT LEVEL                           FULL SCALE
    NEW/RETROFIT                                RETROFIT
    UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %   91.70
    UNIT DESIGN SO2 REMOVAL EFFICIENCY - %        94.20
    CURRENT STATUS                              1
    COMMERCIAL START-UP                         2/79
    INITIAL START-UP                            2/77

** DESIGN AND OPERATING PARAMETERS

** ABSORBER
    NUMBER                                      2
    GENERIC TYPE                                TRAY TOWER
    SUPPLIER                                    BABCOCK-HITACHI
    SHELL GENERIC MATERIAL                      CARBON STEEL
    SHELL MATERIAL TRADE NAME/COMMON TYPE       N/A
    LINER GENERIC MATERIAL                      ORGANIC
    LINER MATERIAL TRADE NAME/COMMON TYPE       PLASTIC
    NUMBER OF CONTACTING ZONES                  5
    LIQUID RECIRCULATION RATE - LITER/S          721.         (11448 GPM)
    L/G RATIO - L/CU.M                             7.0        ( 52.4 GAL/1000 ACF)
    GAS-SIDE PRESSURE DROP - KPA                   3.8        (15.2 IN-H2O)
    INLET GAS FLOW - CU. M/S                     164.76       ( 349142 ACFM)
    INLET GAS TEMPERATURE - C                     52.2        (  126 F)

** MIST ELIMINATOR
    PRE-MIST ELIMINATOR/MIST ELIMINATOR         MIST ELIMINATOR
    NUMBER PER SYSTEM                           2
    GENERIC TYPE                                IMPINGEMENT
    SPECIFIC TYPE                               TUBE BANK
    TRADE NAME/COMMON TYPE                      VERTICAL PARALLEL TUBE BANK
    CONFIGURATION                               HORIZONTAL
    PRESSURE DROP - KPA                            .1         (  .4 IN-H2O)
    WASH WATER SOURCE                           FRESH WATER
    WASH RATE - L/S                                1.3        (   20 GAL/MIN)

** REHEATER
    GENERIC TYPE                                DIRECT COMBUSTION
    SPECIFIC TYPE                               OIL FIRING
    TRADE NAME/COMMON TYPE                      OIL
    INLET FLUE GAS TEMPERATURE - C               120.0        (  248 F)

** FANS
    NUMBER                                      2
    FUNCTION                                    BOOSTER
    APPLICATION                                 INDUCED DRAFT
    SERVICE                                     WET

** TANKS
    SERVICE                                     NUMBER
    -------                                     ------
    PRESCRUBBER RECYCLE                           2
    SCRUBBER RECYCLE                              2
    FILTER LIQUID                               ****
    SLURRY                                      ****
    OXIDATION TOWER                               2

** PUMPS
    SERVICE                                     NUMBER
    -------                                     ------
    COOLER RECYCLE                                2
    ABSORBER RECYCLE                              4
```

ELECTRIC POWER DEVELOPMENT CO: TAKEHARA 1 (CONT.)

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	9
NUMBER OF SPARES	1
CAPACITY	4 GPM
FEED STREAM CHARACTERISTICS	20% SOLIDS
OUTLET STREAM CHARACTERISTICS	88% SOLIDS

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
CONFIGURATION	HORIZONTAL
DIMENSIONS - FT	45 (DIA) X 10 (DEPTH)
FEED STREAM CHARACTERISTICS	12% SOLIDS
OUTLET STREAM CHARACTERISTICS	20% SOLIDS

*** SALEABLE BYPRODUCTS

NATURE	GYPSUM	
FULL LOAD QUANTITY - M T/H	9.89	(10.90 TPH)
QUALITY - %	95.0	
DISPOSITION	MARKETED	

*** SLUDGE

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, GAS FLOW
CONTROL LEVELS	PH: PRESCRUBBER - 5.0, SCRUBBER- 6.0
PROCESS CONTROL MANNER	AUTOMATIC

** WATER BALANCE

WATER LOOP TYPE	OPEN	
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	60	
MAKEUP WATER ADDITION - LITERS/S	14.9	(237 GPM)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/78	SYSTEM							720			
5/78	SYSTEM							744			
6/78	SYSTEM							720			
7/78	SYSTEM							744			
8/78	SYSTEM							744			
9/78	SYSTEM							720			
10/78	SYSTEM							744			
11/78	SYSTEM							720			
12/78	SYSTEM							744			
1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			

EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

ELECTRIC POWER DEVELOPMENT CO: TAKEHARA 1 (CONT.)

PERFORMANCE DATA

** PROBLEMS/SOLUTIONS/COMMENTS

99.95% AVAILABILITY WAS REPORTED FOR THE PERIOD FROM APRIL 1978 THROUGH MARCH 1979.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM							720			
5/79	SYSTEM							744			
6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			
1/80	SYSTEM							744			
2/80	SYSTEM							696			
3/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE APRIL 1979 THROUGH MARCH 1980 PERIOD.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	
5/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
6/80	SYSTEM	87.9	100.0	100.0	87.9	90.10		720	633	633	82.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FOR APPROXIMATELY 3 DAYS IN JUNE TO REMOVE THE SCALE ACCUMULATION IN THE FGD OUTLET DUCT.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/80	SYSTEM	100.0	100.0	100.0	100.0	91.00		744	744	744	95.5
8/80	SYSTEM	100.0	100.0	100.0	100.0	91.70		744	744	744	95.3
9/80	SYSTEM	100.0	100.0	100.0	100.0	93.10		720	720	720	95.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER 1980.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM	100.0	100.0	100.0	100.0	93.40		744	744	744	94.5
11/80	SYSTEM	100.0	100.0	100.0	100.0	93.70		720	720	720	95.2
12/80	SYSTEM	100.0	100.0	100.0	27.7	91.70		744	206	206	22.4

ELECTRIC POWER DEVELOPMENT CO: TAKEHARA 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE FROM DECEMBER 1 THROUGH DECEMBER 25 FOR SCHEDULED MAINTENANCE.

SECTION 15
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FOREIGN FGD SYSTEMS

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COMPANY NAME                                    HOKKAIDO ELECTRIC POWER
PLANT NAME                                      TOMATOATSUMA THERMAL POW
UNIT NUMBER                                     1
CITY                                            TOMAKOMAI
STATE                                           JAPAN
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J          ******         (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  ******         (****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                  ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                350
GROSS UNIT GENERATING CAPACITY - MW               350
NET UNIT GENERATING CAPACITY W/FGD - MW           175
NET UNIT GENERATING CAPACITY WO/FGD - MW          175
EQUIVALENT SCRUBBED CAPACITY - MW                 350

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                            BABCOCK-HITACHI K.K.
     BOILER TYPE                                PULVERIZED COAL
     BOILER SERVICE LOAD                        BASE
     DESIGN BOILER FLUE GAS FLOW - CU.M/S         508.21       (1076939 ACFM)
     BOILER FLUE GAS TEMPERATURE - C              121.1        ( 250 F)
     STACK HEIGHT - M                             170.         ( 558 FT)
     STACK SHELL                                STEEL
     STACK TOP DIAMETER - M                         4.5        ( 14.6 FT)

 ** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                 ******         (108000 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                 ******
     AVERAGE ASH CONTENT - %                       20.50
     RANGE ASH CONTENT - %                      ******
     AVERAGE MOISTURE CONTENT - %                   7.00
     RANGE MOISTURE CONTENT - %                 ******
     AVERAGE SULFUR CONTENT - %                      .30
     RANGE SULFUR CONTENT - %                   ******
     AVERAGE CHLORIDE CONTENT - %               ********
     RANGE CHLORIDE CONTENT - %                 ******

*** PARTICLE CONTROL

 ** ESP
     NUMBER                                      4
     TYPE                                       HOT SIDE
     SUPPLIER                                   HITACHI PLANT ENG & CONST CO
     INLET FLUE GAS CAPACITY - CU.M/S             828.8        (1756252 ACFM)
     INLET FLUE GAS TEMPERATURE - C               363.9        (  687 F)
     PRESSURE DROP - KPA                             .2        (   1. IN-H2O)
     PARTICLE REMOVAL EFFICENCY - %                99.8

 ** PARTICLE SCRUBBER
     NUMBER                                      1
     GENERIC TYPE                               VENTURI TOWER
     SUPPLIER                                   BABCOCK-HITACHI K.K.
     INLET GAS FLOW RATE - CU.M/S                 198.7        ( 421036 ACFM)
     INLET GAS TEMPERATURE - C                     47.2        (   117 F)

*** FGD SYSTEM

 ** GENERAL DATA
     SALEABLE PRODUCT/THROWAWAY PRODUCT          SALEABLE PRODUCT
     SO2 REMOVAL MODE                            WET SCRUBBING
     PROCESS TYPE                                LIMESTONE
     SYSTEM SUPPLIER                             BABCOCK-HITACHI K.K.
     DEVELOPMENT LEVEL                           FULL SCALE
     NEW/RETROFIT                                RETROFIT
     UNIT DESIGN SO2 REMOVAL EFFICIENCY - %         90.00
     CURRENT STATUS                               1
     COMMERCIAL START-UP                         10/80
```

HOKKAIDO ELECTRIC POWER: TOMATOATSUMA THERMAL POW 1 (CONT.)

INITIAL START-UP	7/80	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	1	
SUPPLIER	BABCOCK-HITACHI	
INLET GAS FLOW - CU. M/S	198.69	(421036 ACFM)
INLET GAS TEMPERATURE - C	47.2	(117 F)
PARTICLE REMOVAL EFFICENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
NUMBER PER SYSTEM	1
SPECIFIC TYPE	SHEBURON
CONFIGURATION	VERTICAL

** REHEATER

NUMBER	1	
GENERIC TYPE	WASTE HEAT RECOVERY	
SPECIFIC TYPE	GAS-GAS	
PERCENT GAS BYPASSED - AVG	14.3	
TEMPERATURE INCREASE - C	47.8	(118 F)
INLET FLUE GAS FLOW RATE - CU. M/S	199.17	(422057 ACFM)

** FANS

NUMBER	1	
DESIGN	CENTRIFUGAL	
SUPPLIER	HITACHI,LDT.	
FUNCTION	BOOSTER	
FLUE GAS FLOW RATE - CU.M/S	254.47	(539247 ACFM)
FLUE GAS TEMPERATURE - C	137.2	(279 F)

** REAGENT PREPARATION EQUIPMENT

NUMBER	1
PRODUCT QUALITY - % SOLIDS	92.0

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	2

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	3
NUMBER OF SPARES	1

*** SALEABLE BYPRODUCTS

NATURE	GYPSUM
QUALITY - %	45.0
DISPOSITION	MARKETED

** WATER BALANCE

WATER LOOP TYPE	CLOSED	
MAKEUP WATER ADDITION - LITERS/S	4.0	(63 GPM)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM	100.0	100.0	100.0	70.3	94.40		744	523	523	46.0

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATIONS AT THE TOMATOATSUMA STATION COMMENCED IN OCTOBER 1980.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/80	SYSTEM	100.0	100.0	100.0	85.1	92.40		720	613	613	61.1

HOKKAIDO ELECTRIC POWER: TOMATOATSUMA THERMAL POW 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/80	SYSTEM	100.0	100.0	100.0	100.0	94.10		744	744	744	94.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER SCALE FORMATION WAS OBSERVED IN THE PIPING AND IN A PUMP OF THE WASTE WATER TREATMENT FACILITY. A WATER WASH LINE WAS INSTALLED FOR THE PIPING AND A PUMP WAS ADDED TO ELIMINATE SCALE. THE FGD SYSTEM OPERATION WAS NOT AFFECTED DURING THIS TIME.

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	FOUR CORNERS	
UNIT NUMBER	5A	
CITY	FARMINGTON	
STATE	NEW MEXICO	
REGULATORY CLASSIFICATION	******	
PARTICULATE EMISSION LIMITATION - NG/J	21.	(.050 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258.	(.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2089	
GROSS UNIT GENERATING CAPACITY - MW	755	
NET UNIT GENERATING CAPACITY W/FGD - MW	*****	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	755	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	******	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	22562.	(9700 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	24.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	11.00	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	.81	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	SOUTHERN CALIFORNIA EDISON	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	EXPERIMENTAL	
NEW/RETROFIT	RETROFIT	
CURRENT STATUS	8	
TERMINATION	**/76	
INITIAL START-UP	2/76	
** DESIGN AND OPERATING PARAMETERS		

ARIZONA PUBLIC SERVICE: FOUR CORNERS 5A (CONT.)

** ABSORBER

GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
DIMENSIONS - FT	60 X 28 X 17
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER MATERIAL TRADE NAME/COMMON TYPE	RUBBER,FLAKEGLASS,SILICA POLYESTER RESIN
NUMBER OF CONTACTING ZONES	5

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
NUMBER PER SYSTEM	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL AND CARBON STEEL

** REHEATER

GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLES

** FANS

NUMBER	1
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
CONSTRUCTION MATERIAL GENERIC TYPE	MANGANESE, VANADRUM STEEL

** REAGENT PREPARATION EQUIPMENT

FUNCTION	LIME SLAKING
DEVICE	SLAKER
NUMBER	1

** PUMPS

SERVICE	NUMBER
SLURRY RECIRCULATION	12

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	60 - DIAMETER
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	30% SOLIDS

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/76	SYSTEM							692			

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT NO. 5 WAS FIRST PLACED IN COMMERCIAL OPERATION IN JULY 1970. THE FGD SYSTEM WHICH WAS RETROFITTED ON UNIT NO. 5 WAS A WEIR HORIZONTAL CROSSFLOW SPRAY ABSORBER WHICH WAS FORMERLY INSTALLED AND OPERATED IN A TEST PROGRAM AT THE MOHAVE GENERATING STATION OF THE SOUTHERN CALIFORNIA EDISON COMPANY. THE HORIZONTAL MODULE WAS A FOUR-STAGE SCRUBBING CHAMBER. EACH STAGE CONTAINED A ROW OF 36 EXTERNALLY MOUNTED NOZZLES. THE SLURRY WAS CYCLED THROUGH THE SCRUBBER IN A COUNTERCURRENT MANNER AT A RATE OF 36,000 GPM/ STAGE. THE FRESH LIME SLURRY WAS SPRAYED ACROSS THE FLUE GAS AT THE FOURTH STAGE, WHICH WAS THE DISCHARGE END OF THE SCRUBBING CHAMBER. THE SCRUBBING SOLUTION WAS THEN COLLECTED AND RECYCLED SUCCESSIVELY TO THE THIRD, SECOND, AND FIRST STAGES OF THE SCRUBBING MODULE. THIS ALLOWED COMPLETE DEPLETION OF ANY CONCENTRATION. THE CLEANED GASES THEN PASSED THROUGH A MIST ELIMI-

ARIZONA PUBLIC SERVICE: FOUR CORNERS 5A (CONT.)

PERFORMANCE DATA

NATOR AND WERE REHEATED BEFORE BEING DISCHARGED TO THE STACK. THE SPENT SLURRY WAS DISCHARGED FROM THE SCRUBBING SYSTEM TO A THICKENER AND THE UNDERFLOW WAS PUMPED TO AN ON-SITE SETTLING POND. WATER WAS RETURNED TO THE PROCESS FOR FURTHER USE.

INSTALLATION OF THE MODULE AT THE FOUR CORNERS GENERATING STATION WAS COMPLETED AND THE SYSTEM WAS PLACED IN SERVICE ON FEBRUARY 17, 1976, FOR INITIAL OPERATION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/76	SYSTEM							744			
4/76	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS TAKEN OFF LINE IN MID-APRIL FOR A SCHEDULED BOILER OVERHAUL. THE SYSTEM WAS SCHEDULED TO COME BACK ON LINE IN JULY 1976.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/76	SYSTEM							744			
6/76	SYSTEM							720			
7/76	SYSTEM							744			
8/76	SYSTEM							744			
9/76	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM REMAINED OUT OF SERVICE THROUGH MID-APRIL 1976 DUE TO AN EXTENSIVE OVERHAUL OF THE NO. 5 BOILER PLUS THE DEVELOPMENT OF PROBLEMS WITH THE SCRUBBER MODULE'S REHEATER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/76	SYSTEM							744			
11/76	SYSTEM							720			
12/76	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE PROTOTYPE WAS IN SERVICE THROUGHOUT THE MONTH OF NOVEMBER. ON DECEMBER 6 THE TEST PROGRAM WAS CONCLUDED AND THE UNIT WAS DISMANTLED.

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

```
COMPANY NAME                                  BOSTON EDISON
PLANT NAME                                    MYSTIC
UNIT NUMBER                                   6
CITY                                          CHARLESTOWN
STATE                                         MASSACHUSETTS
REGULATORY CLASSIFICATION                     ******
PARTICULATE EMISSION LIMITATION - NG/J        ******         (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                ******         (****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW            *****
GROSS UNIT GENERATING CAPACITY - MW             150
NET UNIT GENERATING CAPACITY W/FGD - MW       *****
NET UNIT GENERATING CAPACITY WO/FGD - MW      *****
EQUIVALENT SCRUBBED CAPACITY - MW               150

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                          COMBUSTION ENGINEERING
     BOILER TYPE                              OIL FIRED
     BOILER SERVICE LOAD                      ******
     DESIGN BOILER FLUE GAS FLOW - CU.M/S       273.70       ( 580000 ACFM)
     BOILER FLUE GAS TEMPERATURE - C            148.9        ( 300 F)
     STACK HEIGHT - M                            99.         ( 325 FT)
     STACK SHELL                              ******
     STACK TOP DIAMETER - M                   *******        (***** FT)

 ** FUEL DATA
     FUEL TYPE                                OIL
     FUEL GRADE                               NO. 6
     AVERAGE HEAT CONTENT - J/G               ******         (****** BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                              ******
     AVERAGE ASH CONTENT - %                       .07
     RANGE ASH CONTENT - %                    ******
     AVERAGE MOISTURE CONTENT - %                 1.00
     RANGE MOISTURE CONTENT - %               ******
     AVERAGE SULFUR CONTENT - %                   2.00
     RANGE SULFUR CONTENT - %                 ******
     AVERAGE CHLORIDE CONTENT - %             ********
     RANGE CHLORIDE CONTENT - %               ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
     NUMBER                                     0
     TYPE                                     NONE

 ** FABRIC FILTER
     NUMBER                                     0
     TYPE                                     NONE

 ** ESP

 ** PARTICLE SCRUBBER
     GENERIC TYPE                             NONE
     SPECIFIC TYPE                            N/A

*** FGD SYSTEM

 ** GENERAL DATA
     SALEABLE PRODUCT/THROWAWAY PRODUCT       SALEABLE PRODUCT
     SO2 REMOVAL MODE                         WET SCRUBBING
     PROCESS TYPE                             MAGNESIUM OXIDE
     SYSTEM SUPPLIER                          CHEMICO DIVISION, ENVIROTECH
     DEVELOPMENT LEVEL                        DEMONSTRATION
     NEW/RETROFIT                             RETROFIT
     UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %   55.00
     UNIT DESIGN SO2 REMOVAL EFFICIENCY - %        90.00
     CURRENT STATUS                             8
     TERMINATION                              **/74
     COMMERCIAL START-UP                        4/72
```

BOSTON EDISON: MYSTIC 6 (CONT.)

INITIAL START-UP	4/72

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	EPOXY	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	945.	(15000 GPM)
L/G RATIO - L/CU.M	4.4	(33.0 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	200.56	(425000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
NUMBER PER SYSTEM	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
NUMBER OF PASSES PER STAGE	6
WASH WATER SOURCE	FRESH

** REHEATER

NUMBER	0
GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A

** FANS

NUMBER	2
APPLICATION	INDUCED DRAFT

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	1
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
FEED STREAM CHARACTERISTICS	10% SOLIDS

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, FLUE GAS INLET TEMP., SCRUBBER OUTLET TEMP.
CONTROL LEVELS	PH - 6.8
MONITOR LOCATION	PH - BLEED LINE FROM ABSORBER TO CENTRIFUGE
PROCESS CONTROL MANNER	MANUAL
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
4/72	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THIS EXPERIMENTAL MAGNESIUM OXIDE SCRUBBING UNIT WAS RETROFITTED ON A 155 MW, OIL FIRED BOILER. THE SULFUR DIOXIDE AND PARTICLE MATTER REMOVAL OCCURRED IN THE VENTURI SCRUBBER MODULE. THE SO2 WAS CAPTURED AND CONVERTED TO MAGNESIUM SULFITE IN THE VENTURI. THE PRODUCT SLURRY WAS THEN FILTERED AND DRIED. THE DRY MATERIAL CALCINED AT HIGH TEMPERATURES TO DRIVE OFF THE SO2 AND REGENERATE MAGNESIUM OXIDE. THE SO2 STREAM WAS PROCESSED IN A SULFURIC ACID PLANT TO PRODUCE SULFURIC ACID. THE UTILITY AND THE EPA PROVIDED THE MAJOR PORTION OF THE FUNDING FOR THIS

PERFORMANCE DATA

REGENERABLE DEMONSTRATION PROJECT.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/73	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

FROM INITIAL STARTUP IN APRIL 1972 UNTIL MAY 1973 THE SCRUBBER OPERATED INTERMITTENTLY BECAUSE OF MECHANICAL DIFFICULTIES. THE MAJOR PROBLEM ENTAILING DESIGN AND OPERATION OF THE MAGNESIUM SULFITE CRYSTAL DRYER, APPARENTLY WAS RESOLVED BY REDESIGN AND FUEL CHANGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/73	SYSTEM		67.9		55.8			720	592	402	
7/73	SYSTEM		61.0		47.2			744	575	351	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE AND JULY THE LONGEST PERIOD OF CONTINUOUS OPERATION OCCURRED. THE SYSTEM OPERATED 7.5 DAYS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/73	SYSTEM				.0			744	0		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST THE BOILER WAS TAKEN OFF-LINE FOR AN ANNUAL OVERHAUL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/73	SYSTEM		38.1		33.8			720	637	243	
10/73	SYSTEM		60.1		50.7			744	627	377	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER AND OCTOBER HEAVY EROSION/CORROSION IN THE LIQUOR RECIRCULATION PUMPS AND CENTRIFUGE DECREASED THE AVAILABILITY OF THE FGD SYSTEM.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/73	SYSTEM		25.6		22.5			720	629	162	
12/73	SYSTEM		13.1		11.6			744	658	86	
1/74	SYSTEM		27.4		20.4			744	555	152	
2/74	SYSTEM		25.5		20.5			672	541	138	

** PROBLEMS/SOLUTIONS/COMMENTS

IN JANUARY AND FEBRUARY FREQUENT SHUTDOWNS DUE TO BOILER-RELATED PROBLEMS LIMITED SYSTEM OPERATION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/74	SYSTEM		86.5		47.4			744	408	353	

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE FEBRUARY 1974 THE AVAILABILITY OF THE BOILER HAS INCREASED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/74	SYSTEM		80.5		65.4			720	585	471	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL, TWO 7-DAY CONTINUOUS OPERATION PERIODS OCCURRED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/74	SYSTEM		57.4		37.6			744	488	280	

BOSTON EDISON: MYSTIC 6 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY, A TWO WEEK OUTAGE OF THE ACID PLANT WAS THE CAUSE OF A LOW FGD SYSTEM OPERABILITY FIGURE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/74	SYSTEM		51.5		40.0			720	559	288	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE 1974 THE DEMONSTRATION PROGRAM WAS COMPLETED AND THE FGD SYSTEM WAS SHUTDOWN. EPA FUNDING OF THE CALCINING PORTION OF THIS OPERATION EXPIRED. THERE WERE NO DEFINITE PLANS FOR RESTARTING THIS UNIT. MAJOR PROBLEM AREAS ENCOUNTERED DURING THE OPERATION OF THIS PROTOTYPE UNIT INCLUDED TRIHYDRATE INSTEAD OF HEXAHYDRATE SULFITE CRYSTAL FORMATION, DUST PROBLEMS IN THE DRYER, LACK OF STACK GAS REHEAT CAUSING CONDENSATION IN THE STACK, LOUVER DAMPER PROBLEMS, EROSION OF PUMPS, PIPING, AND CENTRIFUGE, AND MINOR ANCILLARY EQUIPMENT FAILURES.

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

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COMPANY NAME                                    COMMONWEALTH EDISON
PLANT NAME                                      WILL COUNY
UNIT NUMBER                                     1A
CITY                                            ROMEOVILLE
STATE                                           ILLINOIS
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J             86.          (  .200 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                    774.          ( 1.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                  ******          (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW               1147
GROSS UNIT GENERATING CAPACITY - MW               167
NET UNIT GENERATING CAPACITY W/FGD - MW           137
NET UNIT GENERATING CAPACITY WO/FGD - MW          144
EQUIVALENT SCRUBBED CAPACITY - MW                 167

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                            BABCOCK & WILCOX
     BOILER TYPE                                CYCLONE
     BOILER SERVICE LOAD                        CYCLING
     DESIGN BOILER FLUE GAS FLOW - CU.M/S         363.36        ( 770000 ACFM)
     BOILER FLUE GAS TEMPERATURE - C              179.4         ( 355 F)
     STACK HEIGHT - M                             107.          ( 350 FT)
     STACK SHELL                                ******
     STACK TOP DIAMETER - M                         3.8         ( 12.4 FT)

 ** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 ******
     AVERAGE HEAT CONTENT - J/G                 22260.          (  9570 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                  9,100 - 10,500
     AVERAGE ASH CONTENT - %                        7.40
     RANGE ASH CONTENT - %                      3 - 16
     AVERAGE MOISTURE CONTENT - %               ********
     RANGE MOISTURE CONTENT - %                 ******
     AVERAGE SULFUR CONTENT - %                     1.50
     RANGE SULFUR CONTENT - %                   0.3 - 4.5
     AVERAGE CHLORIDE CONTENT - %               ********
     RANGE CHLORIDE CONTENT - %                 ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
     NUMBER                                       0
     TYPE                                       NONE

 ** FABRIC FILTER
     NUMBER                                       0
     TYPE                                       NONE

 ** ESP
     NUMBER                                       1
     TYPE                                       COLD SIDE
     SUPPLIER                                   WESTERN PREC. DIVISION, JOY
     INLET FLUE GAS TEMPERATURE - C               179.4         (  355 F)
     PARTICLE REMOVAL EFFICENCY - %                90.0

 ** PARTICLE SCRUBBER
     NUMBER                                       2
     GENERIC TYPE                               VENTURI TOWER
     SPECIFIC TYPE                              VARIABLE-THROAT/SIDE-MOVABLE BLADES
     SUPPLIER                                   BABCOCK & WILCOX
     DIMENSIONS - FT                            8 X 26 X 16 (THROAT 21 X 1.8)
     SHELL GENERIC MATERIAL                     CARBON STEEL
     SHELL SPECIFIC MATERIAL                    AISI 1110
     LINER GENERIC MATERIAL                     ORGANIC,INORGANIC
     LINER SPECIFIC MATERIAL                    VINYL ESTER, HYDRAULICALLY-BONDED CEMENT
     LIQUID RECIRCULATION RATE - LITER/S          365.4         ( 5800 GPM)
     L/G RATIO - LITER/CU.M                         2.4         (18.0 GAL/1000ACF)
     PRESSURE DROP - KPA                            2.2         ( 9.0 IN-H2O)
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COMMONWEALTH EDISON: WILL COUNY 1A (CONT.)

     SUPERFICIAL GAS VELOCITY - M/S                    36.6       (  120.0 FT/S)
     INLET GAS FLOW RATE - CU.M/S                     181.7       ( 385000 ACFM)
     INLET GAS TEMPERATURE - C                        179.4       (   355 F)
     PARTICLE REMOVAL EFFICIENCY - %                   98.0

*** FGD SYSTEM

 ** GENERAL DATA
     SALEABLE PRODUCT/THROWAWAY PRODUCT              THROWAWAY PRODUCT
     SO2 REMOVAL MODE                                WET SCRUBBING
     PROCESS TYPE                                    LIMESTONE
     SYSTEM SUPPLIER                                 BABCOCK & WILCOX
     A-E FIRM                                        BECHTEL
     DEVELOPMENT LEVEL                               FULL SCALE
     NEW/RETROFIT                                    RETROFIT
     UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %      98.00
     UNIT DESIGN SO2 REMOVAL EFFICIENCY - %           76.00
     CURRENT STATUS                                   8
     TERMINATION                                    **/77
     COMMERCIAL START-UP                              2/73
     INITIAL START-UP                                 2/72

 ** DESIGN AND OPERATING PARAMETERS

 ** ABSORBER
     NUMBER                                           2
     GENERIC TYPE                                    TRAY TOWER
     SUPPLIER                                        BABCOCK & WILCOX
     DIMENSIONS - FT                                 16 X 24 X 60
     SHELL GENERIC MATERIAL                          CARBON STEEL
     SHELL SPECIFIC MATERIAL                         HIGH STRENGTH LOW ALLOY
     LINER GENERIC MATERIAL                          COR-TEN
     LINER SPECIFIC MATERIAL                         ORGANIC
     LINER MATERIAL TRADE NAME/COMMON TYPE           RUBBER
     GAS CONTACTING DEVICE TYPE                      PERFORATED TRAYS
     NUMBER OF CONTACTING ZONES                       2
     LIQUID RECIRCULATION RATE - LITER/S            693.        (11000 GPM)
     L/G RATIO - L/CU.M                               4.7       ( 35.0 GAL/1000 ACF)
     GAS-SIDE PRESSURE DROP - KPA                     2.5       (10.0 IN-H2O)
     SUPERFICAL GAS VELOCITY - M/SEC                  3.0       ( 10.0 FT/S)
     INLET GAS FLOW - CU. M/S                       181.68      ( 385000 ACFM)
     INLET GAS TEMPERATURE - C                      179.4       (   355 F)
     PARTICLE REMOVAL EFFICENCY - %                  76.0

 ** MIST ELIMINATOR
     PRE-MIST ELIMINATOR/MIST ELIMINATOR             MIST ELIMINATOR
     NUMBER PER SYSTEM                                2
     GENERIC TYPE                                    IMPINGEMENT
     SPECIFIC TYPE                                   BAFFLE
     TRADE NAME/COMMON TYPE                          CHEVRON VANE
     CONFIGURATION                                   HORIZONTAL
     NUMBER OF STAGES                                 2
     NUMBER OF PASSES PER STAGE                       3
     FREEBOARD DISTANCE - M                           3.05      (10.0 FT)
     DISTANCE BETWEEN VANES - CM                      3.8       ( 1.50 IN)
     VANE ANGLES - DEGREES                           45
     PRESSURE DROP - KPA                               .2       ( 1.0 IN-H2O)
     CONSTRUCTION MATERIAL GENERIC TYPE              FIBERGLASS REINFORCED PLASTIC
     WASH WATER SOURCE                               FRESH & POND WATER
     WASH RATE - L/S                                 71.0       ( 1125 GAL/MIN)

 ** REHEATER
     NUMBER                                           2
     GENERIC TYPE                                    IN-LINE
     SPECIFIC TYPE                                   STEAM
     TEMPERATURE INCREASE - C                        11.1       (    52 F)
     INLET FLUE GAS FLOW RATE - CU. M/S             179.32      ( 380000 ACFM)
     INLET FLUE GAS TEMPERATURE - C                  53.3       (   128 F)
     CONSTRUCTION MATERIAL GENERIC TYPE              CARBON STEEL
```

COMMONWEALTH EDISON: WILL COUNY 1A (CONT.)

```
 ** FANS
     NUMBER                                        2
     FUNCTION                                     BOOSTER
     APPLICATION                                  INDUCED DRAFT
     FLUE GAS TEMPERATURE - C                        82.2        (  180 F)

 ** REAGENT PREPARATION EQUIPMENT
     FUNCTION                                     L/S GRINDING
     DEVICE                                       BALL MILL
     NUMBER                                        2
     FULL LOAD DRY FEED CAPACITY - M.TONS/HR         10.9        (  12 TPH)
     PRODUCT QUALITY - % SOLIDS                      27.5

 ** TANKS
     SERVICE                                      NUMBER
     -------                                      ------
     VENTURI RECYCLE                                 2

 ** PUMPS
     SERVICE                                      NUMBER
     -------                                      ------
     VENTURI RECIRCULATION                           6
     ABSORBER RECIRCULATION                          8

 ** SOLIDS CONCENTRATING/DEWATERING
     DEVICE                                       THICKENER
     NUMBER                                       1
     CONFIGURATION                                CIRCULAR, SLOPED BOTTOM
     DIMENSIONS - FT                              65' DIA. X 15' HIGH

 ** SOLIDS CONCENTRATING/DEWATERING
     DEVICE                                       VACUUM FILTER
     NUMBER                                       1
     CAPACITY                                     90 TPD

*** SLUDGE

 ** TREATMENT
     METHOD                                       FLYASH/LIME STABILIZATION
     PROPRIETARY PROCESS                          CHICAGO ADMIXTURES

 ** DISPOSAL
     NATURE                                       INTERIM
     TYPE                                         EMERGENCY CLAY-LINED POND
     LOCATION                                     ON SITE

 ** DISPOSAL
     NATURE                                       FINAL
     TYPE                                         LANDFILL
     LOCATION                                     OFF SITE
     SITE TRANSPORTATION METHOD                   TRUCK

 ** PROCESS CONTROL AND INSTRUMENTATION
     CHEMICAL PARAMETERS                          PRESSURE, LIMESTONE FEED, PH
     PROCESS CONTROL MANNER                       AUTOMATIC

 ** WATER BALANCE
     WATER LOOP TYPE                              CLOSED
```

COMMONWEALTH EDISON: WILL COUNY 1A (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/72	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

REFER TO THE PERFORMANCE UPDATE INFORMATION FOR WILL COUNTY LOCATED IN SECTION 14 OF THIS REPORT.

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

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COMPANY NAME                                    DAIRYLAND POWER COOP
PLANT NAME                                      ALMA
UNIT NUMBER                                     5
CITY                                            ALMA
STATE                                           WISCONSIN
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J          ******          (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  ******          (****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                  ******          (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                210
GROSS UNIT GENERATING CAPACITY - MW                80
NET UNIT GENERATING CAPACITY W/FGD - MW         *****
NET UNIT GENERATING CAPACITY WO/FGD - MW        *****
EQUIVALENT SCRUBBED CAPACITY - MW                  80

 ** UNIT DATA - BOILER AND STACK
    BOILER SUPPLIER                             ******
    BOILER TYPE                                 ******
    BOILER SERVICE LOAD                         ******
    DESIGN BOILER FLUE GAS FLOW - CU.M/S        ********        (******* ACFM)
    BOILER FLUE GAS TEMPERATURE - C             *******         (**** F)
    STACK HEIGHT - M                            ******          (**** FT)
    STACK SHELL                                 ******
    STACK TOP DIAMETER - M                      *******         (***** FT)

 ** FUEL DATA
    FUEL TYPE                                   COAL
    FUEL GRADE                                  ******
    AVERAGE HEAT CONTENT - J/G                  ******          (****** BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                  10,500 - 11,000
    AVERAGE ASH CONTENT - %                     ********
    RANGE ASH CONTENT - %                       12 - 20
    AVERAGE MOISTURE CONTENT - %                ********
    RANGE MOISTURE CONTENT - %                  3.0 - 3.5
    AVERAGE SULFUR CONTENT - %                  ********
    RANGE SULFUR CONTENT - %                    ******
    AVERAGE CHLORIDE CONTENT - %                ********
    RANGE CHLORIDE CONTENT - %                  ******

*** PARTICLE CONTROL

 ** ESP
    NUMBER                                        1

 ** PARTICLE SCRUBBER
    GENERIC TYPE                                NONE
    SPECIFIC TYPE                               N/A

*** FGD SYSTEM

 ** GENERAL DATA
    SALEABLE PRODUCT/THROWAWAY PRODUCT          THROWAWAY PRODUCT
    SO2 REMOVAL MODE                            WET SCRUBBING
    PROCESS TYPE                                LIME
    SYSTEM SUPPLIER                             FOSTER WHEELER
    DEVELOPMENT LEVEL                           EXPERIMENTAL
    NEW/RETROFIT                                RETROFIT
    UNIT DESIGN SO2 REMOVAL EFFICIENCY - %        32.50
    CURRENT STATUS                                8
    TERMINATION                                 **/74
    COMMERCIAL START-UP                          6/71
```

DAIRYLAND POWER COOP: ALMA 5 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
6/71	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

THIS EXPERIMENTAL WET LIME FURNACE SYSTEM COMMENCED OPERATIONS IN JUNE 1971 AND WAS OPERATIONAL FOR PERIODS UP TO 30 DAYS. IN AUGUST 1974 THE UNIT WAS TESTED FOR TWO DAYS USING WESTERN LOW-SULFUR COAL. THE TEST SHOWED ABOUT 50% SO2 REMOVAL EFFICIENCY, BUT ESP PERFORMANCE WAS ADVERSELY AFFECTED. THE FGD PROJECT HAS BEEN SHUT DOWN INDEFINITELY SINCE AUGUST 1974, AND THERE ARE NO PLANS FOR FUTURE OPERATION.

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

```
COMPANY NAME                                DETROIT EDISON
PLANT NAME                                  ST. CLAIR
UNIT NUMBER                                 6A
CITY                                        BELLE RIVER
STATE                                       MICHIGAN
REGULATORY CLASSIFICATION                   C
PARTICULATE EMISSION LIMITATION - NG/J        86.         (  .200 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J              1376.         ( 3.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J              ******        (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW           1798
GROSS UNIT GENERATING CAPACITY - MW           325
NET UNIT GENERATING CAPACITY W/FGD - MW       154
NET UNIT GENERATING CAPACITY WO/FGD - MW      163
EQUIVALENT SCRUBBED CAPACITY - MW             163

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                        COMBUSTION ENGINEERING
     BOILER TYPE                            ******
     BOILER SERVICE LOAD                    PEAK
     DESIGN BOILER FLUE GAS FLOW - CU.M/S     465.77      ( 987000 ACFM)
     BOILER FLUE GAS TEMPERATURE - C          132.2       ( 270 F)
     STACK HEIGHT - M                         130.        ( 425 FT)
     STACK SHELL                            ******
     STACK TOP DIAMETER - M                 *******       (***** FT)

 ** FUEL DATA
     FUEL TYPE                              COAL
     FUEL GRADE                             SUBBITUMINOUS
     AVERAGE HEAT CONTENT - J/G             22330.        (  9600 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                            9,500 - 9,600
     AVERAGE ASH CONTENT - %                    4.00
     RANGE ASH CONTENT - %                  3.0-4.0
     AVERAGE MOISTURE CONTENT - %              22.60
     RANGE MOISTURE CONTENT - %             22 - 24
     AVERAGE SULFUR CONTENT - %                  .35
     RANGE SULFUR CONTENT - %               0.3 - 0.4
     AVERAGE CHLORIDE CONTENT - %           ********
     RANGE CHLORIDE CONTENT - %             ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
     NUMBER                                  0
     TYPE                                   NONE

 ** FABRIC FILTER
     NUMBER                                  0
     TYPE                                   NONE

 ** ESP
     NUMBER                                  2
     SUPPLIER                               WHEELABRATOR-FRYE
     PARTICLE REMOVAL EFFICENCY - %            90.0

 ** PARTICLE SCRUBBER
     NUMBER                                  2
     GENERIC TYPE                           VENTURI TOWER
     SPECIFIC TYPE                          VARIABLE-THROAT/ADJUSTABLE DRUM
     SUPPLIER                               PEABODY-LURGI
     SHELL GENERIC MATERIAL                 STAINLESS STEEL
     SHELL SPECIFIC MATERIAL                AUSTENITIC
     LINER GENERIC MATERIAL                 ORGANIC
     LINER SPECIFIC MATERIAL                RUBBER
     GAS CONTACTING DEVICE TYPE             RUBBER LINED CARBON STEEL & 316L SS
     LIQUID RECIRCULATION RATE - LITER/S      278.5       ( 4420 GPM)
     L/G RATIO - LITER/CU.M                     2.7       (20.0 GAL/1000ACF)
     PRESSURE DROP - KPA                        3.5       (14.0 IN-H2O)
     SUPERFICIAL GAS VELOCITY - M/S            28.3       (   93.0 FT/S)
     INLET GAS FLOW RATE - CU.M/S             116.6       ( 247000 ACFM)
```

```
DETROIT EDISON: ST. CLAIR 6A (CONT.)

     INLET GAS TEMPERATURE - C                    132.2        (  270 F)

*** FGD SYSTEM

 ** GENERAL DATA
     SALEABLE PRODUCT/THROWAWAY PRODUCT         THROWAWAY PRODUCT
     SO2 REMOVAL MODE                           WET SCRUBBING
     PROCESS TYPE                               LIMESTONE
     SYSTEM SUPPLIER                            PEABODY PROCESS SYSTEMS
     A-E FIRM                                   BECHTEL
     DEVELOPMENT LEVEL                          DEMONSTRATION
     NEW/RETROFIT                               RETROFIT
     UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %   99.70
     UNIT DESIGN SO2 REMOVAL EFFICIENCY - %        90.00
     CURRENT STATUS                               8
     TERMINATION                                **/76
     COMMERCIAL START-UP                          9/75
     INITIAL START-UP                             6/75

 ** DESIGN AND OPERATING PARAMETERS

 ** ABSORBER
     NUMBER                                       2
     GENERIC TYPE                               SPRAY TOWER
     SUPPLIER                                   PEABODY PROCESS SYSTEMS
     SHELL GENERIC MATERIAL                     STAINLESS STEEL
     SHELL SPECIFIC MATERIAL                    AUSTENITIC
     SHELL MATERIAL TRADE NAME/COMMON TYPE      TYPE 316L
     LINER GENERIC MATERIAL                     NONE
     LINER SPECIFIC MATERIAL                    N/A
     LINER MATERIAL TRADE NAME/COMMON TYPE      N/A
     GAS CONTACTING DEVICE TYPE                 NONE
     L/G RATIO - L/CU.M                            10.7        ( 80.0 GAL/1000 ACF)
     GAS-SIDE PRESSURE DROP - KPA                   2.5        (10.0 IN-H2O)
     SUPERFICAL GAS VELOCITY - M/SEC                2.9        (  9.5 FT/S)
     INLET GAS FLOW - CU. M/S                    101.46        ( 215000 ACFM)
     INLET GAS TEMPERATURE - C                     47.8        (  118 F)
     SO2 REMOVAL EFFICIENCY - %                    90.0

 ** MIST ELIMINATOR
     PRE-MIST ELIMINATOR/MIST ELIMINATOR        MIST ELIMINATOR
     NUMBER PER SYSTEM                            2
     GENERIC TYPE                               CENTRIFUGAL
     SPECIFIC TYPE                              RADIAL VANE
     TRADE NAME/COMMON TYPE                     RADIAL BAFFLE
     CONFIGURATION                              HORIZONTAL
     FREEBOARD DISTANCE - M                        1.37        ( 4.5 FT)
     DISTANCE BETWEEN VANES - CM                  20.3         ( 8.00 IN)
     VANE ANGLES - DEGREES                       45
     PRESSURE DROP - KPA                            .0         (  .2 IN-H2O)
     SUPERFICAL GAS VELOCITY - M/S                 3.0         ( 10.0 FT/S)
     CONSTRUCTION MATERIAL GENERIC TYPE         316L SS

 ** REHEATER
     NUMBER                                       1
     GENERIC TYPE                               DIRECT COMBUSTION
     SPECIFIC TYPE                              EXTERNAL COMBUSTION CHAMBER
     TRADE NAME/COMMON TYPE                     OIL
     PERCENT GAS BYPASSED - AVG                     .0
     TEMPERATURE INCREASE - C                     10.0         (   50 F)
     INLET FLUE GAS FLOW RATE - CU. M/S          187.20        ( 396700 ACFM)
     INLET FLUE GAS TEMPERATURE - C               50.0         (  122 F)

 ** FANS
     NUMBER                                       1
     SUPPLIER                                   PEABODY ENGINEERING
     FUNCTION                                   BOOSTER
     APPLICATION                                INDUCED DRAFT
     SERVICE                                    WET
     CONSTRUCTION MATERIAL GENERIC TYPE         316L SS
```

DETROIT EDISON: ST. CLAIR 6A (CONT.)

```
 ** REAGENT PREPARATION EQUIPMENT
     NUMBER                                         1
     PRODUCT QUALITY - % SOLIDS                        35.0

 ** PUMPS
     SERVICE                                      NUMBER
     -------                                      ------
     VENTURI RECIRCULATION                           3
     SPRAY TOWER RECIRCULATION                       6

 ** SOLIDS CONCENTRATING/DEWATERING
     DEVICE                                       NONE
     NUMBER                                         0

*** SLUDGE

 ** DISPOSAL
     NATURE                                       FINAL
     TYPE                                         POND
     SITE TRANSPORTATION METHOD                   PIPE LINE
     SITE TREATMENT                               CLAY LINED
     SITE SERVICE LIFE - YRS                        1

 ** PROCESS CONTROL AND INSTRUMENTATION
     CHEMICAL PARAMETERS                          PH, SOLIDS
     CONTROL LEVELS                               PH- 5.8-6.0,SOLIDS- 15% MAX.
     MONITOR LOCATION                             RECIRCULATION TANK
     PROCESS CONTROL MANNER                       AUTOMATIC
     PROCESS CHEMISTRY MODE                       FEEDBACK

 ** WATER BALANCE
     WATER LOOP TYPE                              OPEN


-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 0/75  SYSTEM

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          REFER TO THE PERFORMANCE UPDATE INFORMATION FOR ST. CLAIR 6 LOCATED IN
                          SECTION 14 OF THIS REPORT.
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SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	GULF POWER	
PLANT NAME	SCHOLZ	
UNIT NUMBER	1A	
CITY	SNEADS	
STATE	FLORIDA	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	80	
GROSS UNIT GENERATING CAPACITY - MW	48	
NET UNIT GENERATING CAPACITY W/FGD - MW	40	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	48	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	146.1	(295 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	5.00	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	0.15 MAX.	
*** PARTICLE CONTROL		
** ESP		
NUMBER	1	
TYPE	COLD SIDE	
SUPPLIER	BUELL DIVISION, ENVIROTECH	
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATES	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED CEMENT	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	DUAL ALKALI	
SYSTEM SUPPLIER	COMBUSTION EQUIP ASSOCIATES	
DEVELOPMENT LEVEL	PROTOTYPE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.70	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.00	
CURRENT STATUS	8	

GULF POWER: SCHOLZ 1A (CONT.)

TERMINATION	**/76
COMMERCIAL START-UP	2/75

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

GENERIC TYPE	VENTURI TOWER
SUPPLIER	COMBUSTION EQUIP ASSOCIATES
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER
LINER MATERIAL TRADE NAME/COMMON TYPE	HEIL

** REHEATER

NUMBER	1
PERCENT GAS BYPASSED - AVG	5.0

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	VACUUM FILTER
NUMBER	1
CONFIGURATION	ROTARY DRUM
SHELL SPECIFIC MATERIAL TYPE	PLASTIC & FIBERGLASS

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	LINED POND
LOCATION	ON SITE

** WATER BALANCE

WATER LOOP TYPE	CLOSED

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/75	SYSTEM		98.9		67.6			672	459	454	

** PROBLEMS/SOLUTIONS/COMMENTS

THIS PROTOTYPE FGD SYSTEM INSTALLED AT THE SCHOLZ STEAM PLANT WAS INSTALLED ON THE NO. 1 BOILER. THE SYSTEM WAS DESIGNED TO HANDLE APPROXIMATELY 50% OF THE FLUE GAS FROM THE BOILER. THE BOILER WAS RETROFITTED WITH A SECTIONALIZED, HIGH EFFICIENCY ESP INSTALLED UPSTREAM OF THE FGD SYSTEM AND CAPABLE OF 99.7% PARTICLE MATTER REMOVAL.

THE PROTOTYPE SYSTEM INCORPORATED A HIGH DEGREE OF FLEXIBILITY FOR GENERATION OF DESIGN AND OPERATING INFORMATION FOR A WIDE VARIETY OF APPLICATIONS. ALTHOUGH THE BASIC MODE OF SYSTEM OPERATION WAS DUAL ALKALI WITH LIME REGENERATION, THE SYSTEM WAS DESIGNED TO ACCOMMODATE LIMESTONE REGENERATION AND LIME/LIMESTONE REGENERATION. THE SYSTEM CONSISTED OF A VENTURI SCRUBBER AND AN ABSORPTION TOWER, WITH AN ADDITIONAL STORAGE SILO FOR LIMESTONE, A MIX TANK, AND OTHER ASSORTED TANKS, PUMPS, CONTROLLERS, PIPING, AND A LINED DISPOSAL POND.

THE PROTOTYPE DUAL ALKALI SCRUBBING SYSTEM WAS COMPLETED AND PUT IN OPERATION IN EARLY FEBRUARY 1975.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/75	SYSTEM		95.7		65.2			744	507	485	
4/75	SYSTEM		55.6		46.7			720	604	336	
5/75	SYSTEM		62.7		50.4			744	598	375	
6/75	SYSTEM		100.0		100.0			720	720	720	

GULF POWER: SCHOLZ 1A (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
7/75	SYSTEM		32.4		29.7			744	683	221	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS OPERATED FROM FEBRUARY 8, 1975 UNTIL JULY 18 WHEN IT WAS TAKEN OUT OF SERVICE FOR TWO MONTHS FOR MODIFICATIONS, REPAIRS AND REPLACEMENT OF PARTS. THE SYSTEM WAS UNAVAILABLE FOR A 491 HOUR PERIOD DUE TO SOME NECESSARY ADJUSTMENTS AND MODIFICATIONS FOR A FORMAL EPA TEST PROGRAM IN MID-MAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
8/75	SYSTEM		.0		.0			744	744	0	
9/75	SYSTEM		44.0		35.3			720	577	254	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS SHUT DOWN FROM MID-JULY TO MID-SEPTEMBER FOR A MECHANICAL OVERHAUL INVOLVING REPLACEMENT OF VALVE PARTS THAT HAD FAILED. THE SYSTEM WAS PUT BACK IN OPERATION ON SEPTEMBER 16.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
10/75	SYSTEM		100.0		75.1			744	559	559	

** PROBLEMS/SOLUTIONS/COMMENTS

FROM MID-SEPTEMBER UNTIL MID-OCTOBER THE AIR PREHEATER WAS REPAIRED AND BOILER OPERATION WAS ADJUSTED TO REDUCE OXYGEN LEVELS IN THE FLUE GAS TO THE 5-6% RANGE. THE SYSTEM OPERATED APPROXIMATELY 800 HOURS DURING THIS PERIOD.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
11/75	SYSTEM		90.3		77.8			720	620	560	
12/75	SYSTEM		100.0		98.4			744	732	732	
1/76	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM RAN CONTINUOUSLY FOR THE REMAINDER OF THE TEST PERIOD THROUGH JANUARY 2, 1976. SO2 LEVELS DURING THIS PERIOD RANGED FROM 800 TO 1700 PPM. THE SYSTEM OPERATED IN THE CONCENTRATED MODE THROUGHOUT THE REMAINDER OF THE TEST PERIOD. IN THE PERIOD FROM MID-SEPTEMBER TO JANUARY 2, 1976 THE SYSTEM OPERATED ABOUT 2100 HOURS, WITH AN OPERABILITY FACTOR OF 97%.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
2/76	SYSTEM							696			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM AND BOILER WERE SHUT DOWN FOR A SCHEDULED OVERHAUL. THE SYSTEM WAS SCHEDULED TO RESTART IN MID-MARCH AND WAS TO CONTINUE UNTIL JUNE. DURING THIS OPERATING PERIOD HIGH-SULFUR COAL (3.5-4.0%) WAS TO BE BURNED TO ALLOW EVALUATION OF SYSTEM PERFORMANCE ON HIGH SULFUR COAL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
3/76	SYSTEM		60.0		59.8			744	742	445	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS RETURNED TO SERVICE ON MARCH 12, 1976. THE SYSTEM OPERATED A TOTAL OF 445 HOURS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
5/76	SYSTEM		88.6		87.5			744	735	651	

GULF POWER: SCHOLZ 1A (CONT.)

```
-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ -- --- ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

        ** PROBLEMS/SOLUTIONS/COMMENTS

                    DURING APRIL AND MAY SOME MINOR MECHANICAL PROBLEMS WITH THE AGITATOR
                    SHAFT WERE ENCOUNTERED.

                    SOME PROBLEMS WERE EXPERIENCED WITH THE CONTROL VALVES DURING APRIL AND MAY
                    ACCOUNTING FOR SOME FGD OUTAGE TIME.

                    SINCE THE SYSTEM RESTART IN MARCH, SO2 INLET CONCENTRATION LEVELS RANGED
                    FROM 2000 TO 2500 PPM DUE TO THE BURNING OF HIGH SULFUR COAL.

 6/76  SYSTEM             97.7                    89.0                     720    656    641

        ** PROBLEMS/SOLUTIONS/COMMENTS

                    DURING THE LAST PHASE OF OPERATION, THE SYSTEM WAS TREATING FLUE GAS OF
                    VARYING PARTICULATE MATTER LOADS.  THE UPSTREAM ESP WAS SELECTIVELY DE-EN-
                    ERGIZED, BOTH PARTIALLY AND TOTALLY, WITH NO MAJOR UPSETS IN THE PROCESS
                    CHEMISTRY RESULTING.  BOILER LOAD VARIATION RANGED FROM 30 TO 100%.

 7/76  SYSTEM            100.0                     7.3                     744     54     54

        ** PROBLEMS/SOLUTIONS/COMMENTS

                    ON JULY 3, 1976 THE PROTOTYPE TEST PROGRAM WAS CONCLUDED.
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SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

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COMPANY NAME                                  GULF POWER
PLANT NAME                                    SCHOLZ
UNIT NUMBER                                   1B,2B
CITY                                          SNEADS
STATE                                         FLORIDA
REGULATORY CLASSIFICATION                     C
PARTICULATE EMISSION LIMITATION - NG/J        ******         (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  516.         ( 1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                80
GROSS UNIT GENERATING CAPACITY - MW               48
NET UNIT GENERATING CAPACITY W/FGD - MW           40
NET UNIT GENERATING CAPACITY WO/FGD - MW       *****
EQUIVALENT SCRUBBED CAPACITY - MW                 48

 ** UNIT DATA - BOILER AND STACK
    BOILER SUPPLIER                           BABCOCK & WILCOX
    BOILER TYPE                               PULVERIZED COAL
    BOILER SERVICE LOAD                       BASE
    DESIGN BOILER FLUE GAS FLOW - CU.M/S      ********        (******* ACFM)
    BOILER FLUE GAS TEMPERATURE - C             146.1         ( 295 F)
    STACK HEIGHT - M                            23.           (  76 FT)
    STACK SHELL                               NONE
    STACK TOP DIAMETER - M                    *******         (***** FT)

 ** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                ******
    AVERAGE HEAT CONTENT - J/G                ******          (****** BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                ******
    AVERAGE ASH CONTENT - %                   ********
    RANGE ASH CONTENT - %                     ******
    AVERAGE MOISTURE CONTENT - %              ********
    RANGE MOISTURE CONTENT - %                ******
    AVERAGE SULFUR CONTENT - %                    5.00
    RANGE SULFUR CONTENT - %                  ******
    AVERAGE CHLORIDE CONTENT - %              ********
    RANGE CHLORIDE CONTENT - %                0.15 MAX.

*** PARTICLE CONTROL

 ** ESP
    NUMBER                                    1
    TYPE                                      COLD SIDE
    SUPPLIER                                  BUELL DIVISION, ENVIROTECH
    PARTICLE REMOVAL EFFICENCY - %                99.5
 ** PARTICLE SCRUBBER
    NUMBER                                    1
    GENERIC TYPE                              VENTURI TOWER
    SPECIFIC TYPE                             VARIABLE-THROAT/TOP-ENTRY PLUMB BOB
    SUPPLIER                                  CHIYODA INTERNATIONAL
    SHELL GENERIC MATERIAL                    CARBON STEEL
    SHELL SPECIFIC MATERIAL                   AISI 1110
    LINER GENERIC MATERIAL                    INORGANIC
    LINER SPECIFIC MATERIAL                   HYDRAULICALLY-BONDED CEMENT
*** FGD SYSTEM

 ** GENERAL DATA
    SALEABLE PRODUCT/THROWAWAY PRODUCT        THROWAWAY PRODUCT
    SO2 REMOVAL MODE                          WET SCRUBBING
    PROCESS TYPE                              THOROUGHBRED 101
    SYSTEM SUPPLIER                           CHIYODA INTERNATIONAL
    DEVELOPMENT LEVEL                         PROTOTYPE
    NEW/RETROFIT                              RETROFIT
    UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %   99.70
    UNIT DESIGN SO2 REMOVAL EFFICIENCY - %        90.00
    CURRENT STATUS                            8
```

GULF POWER: SCHOLZ 1B,2B (CONT.)

TERMINATION	**/77
COMMERCIAL START-UP	2/75

### ** DESIGN AND OPERATING PARAMETERS

**** ABSORBER**

NUMBER	1
GENERIC TYPE	PACKED TOWER
SUPPLIER	CHIYODA INTERNATIONAL
SHELL GENERIC MATERIAL	STAINLESS STEEL
SHELL SPECIFIC MATERIAL	AUSTENITIC
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L
LINER GENERIC MATERIAL	NONE
LINER SPECIFIC MATERIAL	N/A
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A

**** MIST ELIMINATOR**

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
NUMBER PER SYSTEM	2
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CHEVRON VANE

**** REHEATER**

PERCENT GAS BYPASSED - AVG	5.0

**** SOLIDS CONCENTRATING/DEWATERING**

NUMBER	1
CONFIGURATION	CONTINUOUS SCREW-DECANTER/SOLID BOWL

**** WATER BALANCE**

WATER LOOP TYPE	OPEN

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/75	SYSTEM							672	672		

**** PROBLEMS/SOLUTIONS/COMMENTS**

THE FGD SYSTEM AT SCHOLZ 1B AND 2B WAS DESIGNED FOR TESTING AND PROCESS DEMONSTRATION OF THE THROUGHBRED 101 PROCESS ON A COAL-FIRED APPLICATION. THE PROCESS IS USED IN JAPAN EXCLUSIVELY ON OIL-FIRED AND GAS-FIRED BOILERS, AND TAIL GAS FROM CLAUS UNITS. THE SYSTEM WAS DESIGNED TO HANDLE 50% OF THE LOAD FROM EITHER OF THE TWO BOILERS. VARIOUS TEST COALS WITH SULFUR CONTENTS RANGING UP TO 5% WERE SCHEDULED FOR BURNING. THE PARTICLE MATTER LOADS FROM THE ESP RANGED FROM 0.02 TO 0.1 GR/SCF. FLUE GAS FROM THE ESP WAS QUENCHED WITH COOLING WATER TO REMOVE ADDITIONAL FLY ASH AND TO COOL THE GAS BEFORE IT ENTERED THE ABSORBER. THE SO2 WAS ABSORBED IN WATER AND CATALYTICALLY OXIDIZED WITH AIR TO FORM SULFURIC ACID. THE DILUTE ACID WAS RECIRCULATED THROUGH THE ABSORBER. A PORTION OF THE ACID WAS NEUTRALIZED WITH LIMESTONE TO PRODUCE GYPSUM AS A BY-PRODUCT.

THE INITIAL SHAKEDOWN AND DEBUGGING OPERATIONS AT THIS PILOT PLANT SIZE DEMONSTRATION UNIT COMMENCED ON FEBRUARY 11, 1975. PROBLEMS ENCOUNTERED INCLUDED CRACKS IN THE FRP LINING AT THE OXIDIZING TOWER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/75	SYSTEM							744			

**** PROBLEMS/SOLUTIONS/COMMENTS**

AFTER INITIAL OPERATION FOR BREAK-IN TESTS IN MARCH, THE SYSTEM WAS SHUTDOWN FOR INTERNAL INSPECTION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/75	SYSTEM		27.8		27.8			720	720	200	
5/75	SYSTEM		13.4		13.4			744	744	100	

```
------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER FGD    CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 6/75  SYSTEM                 100.0                    95.1                  720   685    685

 7/75  SYSTEM                  83.9                    83.9                  744   744    624

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         RELIABILTY TESTS WERE PERFORMED IN JULY ALTHOUGH EMISSION TESTS HAD NOT
                         BEEN RUN AT THIS TIME.

BAD C3471 ****
BAD C3471 ****
                         UP TO THIS POINT, SOME PUMP AND INSTRUMENTATION FAILURES HAD OCCURRED.

                         DURING JULY ONE CENTRIFUGE BECAME UNBALANCED, REQUIRING THE SPARE TO BE
                         PLACED IN SERVICE.

 8/75  SYSTEM                                                                744

 9/75  SYSTEM                  46.8                    46.8                  720   720    337

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         DURING THE MONTH OF AUGUST BOTH CENTRIFUGES BECAME UNBALANCED REQUIRING
                         A FORCED OUTAGE WHICH EXTENDED INTO MID-SEPTEMBER.

                         THE UNIT OPERATED AT A 95% SO2 REMOVAL EFFICIENCY DURING THE MONTH OF
                         SEPTEMBER.

10/75  SYSTEM                 100.0                   100.0                  744   744    744

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         THE DISCHARGE OF WASTE WATER FROM THIS SYSTEM WAS A CONTIUOUS PROBLEM
                         AREA.

11/75  SYSTEM                 100.0                   100.0                  720   720    720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         A MINOR OUTAGE OF LESS THAN ONE HOUR WAS NECESSARY TO REPAIR A PINHOLE
                         IN THE PRESCRUBBER FRP LINER AND TO REPAIR A BROKEN FLUE GAS BLOWER INLET
                         VANE.

12/75  SYSTEM                  97.6                    97.6                  744   744    726

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         SCRUBBER OUTAGES DURING DECEMBER RESULTED FROM CONTINUING REPAIRS TO THE
                         PINHOLE IN THE PRESCRUBBER FRP LINER.

 1/76  SYSTEM                  66.2                    60.5                  744   680    450

 2/76  SYSTEM                  11.2                    11.1                  696   690     77

       ** PROBLEMS/SOLUTIONS/COMMENTS

                         OUTAGE TIME IN JANUARY AND FEBRUARY WAS PRIMARILY FOR REPAIR AND MODIFI-
                         CATION OF THE SUCTION AND DISCHARGE PIPING ON THE ABSORBENT CIRCULATING
                         PUMPS.  THESE FRP LINES FAILED IN JANUARY AT SOME WEAK JOINTS.

                         SO2 REMOVAL EFFICIENCY UP TO THIS PERIOD HAS BEEN AS HIGH AS 95%.

 3/76  SYSTEM                  99.6                    99.6                  744   744    741
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GULF POWER: SCHOLZ 1B,2B (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/76	SYSTEM		14.0		14.0			720	720	101	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE SYSTEM WAS SHUTDOWN ON APRIL 5 TO ALLOW SYSTEM MODIFICATIONS FOR REDUCING THE QUANTITY OF LIQUID WASTE FROM THE SYSTEM. THE SYSTEM WAS SHUTDOWN ON APRIL 24 BECAUSE OF EXTENSIVE FIRE DAMAGE IN THE OXIDIZING TOWER. THE FIRE, CAUSED BY A WELDING ACCIDENT, DAMAGED FRP AND POLYPROPYLENE COMPONENTS IN THE OXIDIZING TOWER.										
5/76	SYSTEM				.0			744		0	
6/76	SYSTEM				.0			720		0	
7/76	SYSTEM				.0			744		0	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE SYSTEM REMAINED OUT OF SERVICE DURING MAY, JUNE AND JULY TO REPAIR THE FIRE DAMAGED AREAS.										
8/76	SYSTEM		66.1		66.1			744	744	492	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE SYSTEM CAME BACK ON LINE IN AUGUST; BUT, WAS BROUGHT DOWN DURING THE MONTH TO COMPLETE ADDITIONAL REPAIRS WHICH WENT UNDETECTED DURING THE PREVIOUS OUTAGE. THESE ADDITIONAL REPAIRS ACCOUNTED FOR APPROXIMATELY 242 HOURS OF OUTAGE TIME. THE WATERS SAVINGS PROGRAM WAS TESTED DURING AUGUST. THE TEST PROGRAM CALLED FOR A REDUCTION IN WASTEWATER BLOWDOWN AND FRESH WATER MAKEUP REQUIREMENTS BY RECYCLING THE MOTHER LIQUOR BLEED BACK TO THE PROCESS FOR ADDITIONAL SERVICE.										
9/76	SYSTEM	99.3	68.9	99.3	68.9			720	720	496	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	THE SYSTEM WAS FORCED OUT OF SERVICE APPROXIMATELY FIVE HOURS DURING SEPTEMBER.										
10/76	SYSTEM	70.6	48.0	62.0	48.0			744	744	357	
	** PROBLEMS/SOLUTIONS/COMMENTS										
	DURING OCTOBER SYSTEM DOWN TIME AMOUNTED TO APPROXIMATELY 387 HOURS. OF THIS TOTAL 218 HOURS WERE REPORTED TO REPAIR ANTICIPATED DAMAGES INCURRED IN THE PRESCRUBBER RESULTING FROM OPERATIONS IN THE WATER SAVINGS PROGRAM. SPECIFICALLY, THE LINING HAD SUFFERED FROM EXTENSIVE CORROSION DAMAGE BECAUSE OF HIGH ACID CONCENTRATIONS WHICH DEVELOPED IN THE SCRUBBER SOLUTION. DURING OCTOBER SYSTEM DOWN TIME AMOUNTED TO APPROXIMATELY 387 HOURS. OF										
11/76	SYSTEM	99.6	99.6	99.6	99.6			720	720	717	
12/76	SYSTEM	99.6	99.6	99.6	99.6			744	744	741	

GULF POWER: SCHOLZ 1B,2B (CONT.)

PERFORMANCE DATA

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER AND DECEMBER SCRUBBER OUTAGES TOTALLED 6.5 HOURS. PROBLEMS INCLUDED A MALFUNCTION OF A LEVEL INDICATOR, A BROKEN GUIDE VANE, AND AN OPERATOR ERROR RESULTING IN A LEAK OF SLURRY INTO THE WATER HEADER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/77	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
2/77	SYSTEM	100.0	100.0	100.0	100.0			672	672	672	
3/77	SYSTEM	100.0		100.0				744	744	514	

** PROBLEMS/SOLUTIONS/COMMENTS

THE CT-101 TESTING AND DEMONSTRATION PROGRAM WAS CONCLUDED ON MARCH 22. DURING JANUARY, FEBRUARY AND MARCH THE TOTAL SCRUBBER OUTAGE TIME WAS 0.33 HOUR. THE SYSTEM HAD OPERATED ON A VIRTUALLY CONTINUOUS BASIS SINCE OCTOBER 17, 1976.

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

```
COMPANY NAME                                    GULF POWER
PLANT NAME                                      SCHOLZ
UNIT NUMBER                                     1,2
CITY                                            SNEADS
STATE                                           FLORIDA
REGULATORY CLASSIFICATION                       C
PARTICULATE EMISSION LIMITATION - NG/J          ******          (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  ******          (****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                  ******          (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                 80
GROSS UNIT GENERATING CAPACITY - MW                23
NET UNIT GENERATING CAPACITY W/FGD - MW            23
NET UNIT GENERATING CAPACITY WO/FGD - MW        *****
EQUIVALENT SCRUBBED CAPACITY - MW                  23

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                            BABCOCK & WILCOX
     BOILER TYPE                                PULVERIZED COAL
     BOILER SERVICE LOAD                        BASE
     DESIGN BOILER FLUE GAS FLOW - CU.M/S       ********        (******* ACFM)
     BOILER FLUE GAS TEMPERATURE - C            *******         (**** F)
     STACK HEIGHT - M                              23.          (  76 FT)
     STACK SHELL                                FRP
     STACK TOP DIAMETER - M                     *******         (***** FT)

 ** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 BITUMINOUS
     AVERAGE HEAT CONTENT - J/G                 29075.          ( 12500 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                 ******
     AVERAGE ASH CONTENT - %                       11.00
     RANGE ASH CONTENT - %                      ******
     AVERAGE MOISTURE CONTENT - %                   5.00
     RANGE MOISTURE CONTENT - %                 ******
     AVERAGE SULFUR CONTENT - %                     2.50
     RANGE SULFUR CONTENT - %                   2.5-5.0
     AVERAGE CHLORIDE CONTENT - %               ********
     RANGE CHLORIDE CONTENT - %                 ******

*** PARTICLE CONTROL

 ** ESP
     NUMBER                                      2
     TYPE                                       COLD SIDE
     SUPPLIER                                   BUELL DIVISION, ENVIROTECH
     INLET FLUE GAS TEMPERATURE - C               151.7         (  305 F)
     PARTICLE REMOVAL EFFICENCY - %                99.5

 ** PARTICLE SCRUBBER
     GENERIC TYPE                               NONE
     SPECIFIC TYPE                              N/A

*** FGD SYSTEM

 ** GENERAL DATA
     SALEABLE PRODUCT/THROWAWAY PRODUCT         THROWAWAY PRODUCT
     SO2 REMOVAL MODE                           WET SCRUBBING
     PROCESS TYPE                               LIMESTONE/THOROUGHBRED 121
     PROCESS ADDITIVES                          NONE
     SYSTEM SUPPLIER                            CHIYODA INTERNATIONAL
     A-E FIRM                                   CHIYODA CHEMICAL ENG'R & CONST. CO.
     DEVELOPMENT LEVEL                          PROTOTYPE
     NEW/RETROFIT                               RETROFIT
     UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %   99.50
     UNIT DESIGN SO2 REMOVAL EFFICIENCY - %        90.00
     CURRENT STATUS                              8
     TERMINATION                                **/79
     INITIAL START-UP                            8/78
```

```
GULF POWER: SCHOLZ 1,2 (CONT.)

 ** DESIGN AND OPERATING PARAMETERS

 ** ABSORBER
     NUMBER                                     1
     GENERIC TYPE                              MECHANICALLY-AIDED TOWER
     SPECIFIC TYPE                             GAS SPARGER
     TRADE NAME/COMMON TYPE                    JET BUBBLER REACTOR
     SUPPLIER                                  CHIYODA INTERNATIONAL
     DIMENSIONS - FT                           24 FT DIA.
     SHELL GENERIC MATERIAL                    STAINLESS STEEL
     SHELL SPECIFIC MATERIAL                   AUSTENITIC
     LINER GENERIC MATERIAL                    ORGANIC
     LINER SPECIFIC MATERIAL                   FIBER-REINFORCED POLYESTER
     GAS CONTACTING DEVICE TYPE                SPARGER
     NUMBER OF CONTACTING ZONES                 1
     INLET GAS FLOW - CU. M/S                     37.75       (  80000 ACFM)
     INLET GAS TEMPERATURE - C                  148.9         (   300 F)
     SO2 REMOVAL EFFICIENCY - %                   95.0

 ** MIST ELIMINATOR
     PRE-MIST ELIMINATOR/MIST ELIMINATOR       MIST ELIMINATOR
     NUMBER PER SYSTEM                          1
     GENERIC TYPE                              IMPINGEMENT
     SPECIFIC TYPE                             BAFFLE
     TRADE NAME/COMMON TYPE                    CHEVRON VANE
     CONFIGURATION                             VERTICAL
     NUMBER OF STAGES                               2
     NUMBER OF PASSES PER STAGE                     2
     PRESSURE DROP - KPA                             .2       ( 1.0 IN-H2O)

 ** REHEATER
     GENERIC TYPE                              NONE
     SPECIFIC TYPE                             N/A
     TRADE NAME/COMMON TYPE                    N/A

 ** FANS
     NUMBER                                     1
     APPLICATION                               FORCED DRAFT
     FLUE GAS FLOW RATE - CU.M/S                  25.01       (  53000 ACFM)
     FLUE GAS TEMPERATURE - C                   148.9         (   300 F)

*** SALEABLE BYPRODUCTS
     NATURE                                    GYPSUM
     DISPOSITION                               STACKED IN POND

*** SLUDGE

 ** PROCESS CONTROL AND INSTRUMENTATION
     PROCESS CONTROL MANNER                    MANUAL

 ** WATER BALANCE
     WATER LOOP TYPE                           CLOSED


-------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 8/78  SYSTEM                                                              744
```

GULF POWER: SCHOLZ 1,2 (CONT.)

```
-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL  PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           OPERATION BEGAN ON AUGUST 30, 1978.

                           NO INITIAL OPERATIONAL PROBLEMS WERE REPORTED.

 9/78  SYSTEM                                                                720

10/78  SYSTEM                 100.0                                          720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           NO MAJOR OPERATIONAL PROBLEMS WERE REPORTED.

                           A 130 HOUR SCHEDULED OUTAGE OCCURRED IN OCTOBER.

11/78  SYSTEM                  94.8                                          720

12/78  SYSTEM                 100.0                                          744            0

       ** PROBLEMS/SOLUTIONS/COMMENTS

                           THERE WERE NO UNPLANNED SHUTDOWNS DURING DECEMBER AND JANUARY.

                           THE SYSTEM WAS BEING OPERATED IN WHAT WAS CALLED PHASE II OF THE TESTING.
                           THE SYSTEM WAS DELIBERATELY BEING UPSET FROM EQUILIBRIUM (PH, OXIDIZING AI
                           INPUT, ETC.) TO SEE HOW IT RESPONDED.

 1/79  SYSTEM                 100.0                                          744            0

 2/79  SYSTEM                  98.3                    98.4                  672   672    661

 3/79  SYSTEM     100.0       100.0       100.0       100.0                  744   744    744

 4/79  SYSTEM     100.0       100.0       100.0       100.0                  720   720    720

       ** PROBLEMS/SOLUTIONS/COMMENTS

                          ONE PUMP FAILURE CAUSING A 5 MINUTE OUTAGE WAS REPORTED BY THE UTILITY.

                          HIGH PARTICULATE LOADING TESTS WERE DONE IN APRIL.  THE ESP WAS TOTALLY
                          SHUT DOWN.  THE SO2 REMOVAL WAS NOT AFFECTED BUT THE GYPSUM PRODUCT WAS
                          TEMPORARILY AFFECTED.  HIGH CHLORIDE TESTS WERE ALSO PERFORMED BY ADDING
                          CALCIUM CHLORIDE TO THE SYSTEM.  A RESULTANT CONCENTRATION OF 6000 PPM
                          CHLORIDE WAS FOUND IN THE UNDERFLOW.  NO SIGNIFICANT SCALING WAS ENCOUNT-
                          ERED.

 5/79  SYSTEM                                                                744

 6/79  SYSTEM                                                                720

       ** PROBLEMS/SOLUTIONS/COMMENTS

BAD C3471 ****
                          THE FGD SYSTEM OPERATED THROUGH THE 24TH OF MAY WHEN THE SYSTEM WAS RE-
                          MOVED FROM SERVICE BECAUSE THE EPRI STUDIES WERE COMPLETED.
                          JUNE:
                          AFTER SHUTDOWN THE UNIT WAS MODIFIED TO SIMULATE A SMALLER JET BUBBLER
                          REACTOR WITH THE SAME AMOUNT OF FLUE GAS.  THIS WAS DONE BY PLUGGING SOME
                          OF THE SPARGERS AND RISER TUBES.  THE UNIT WAS OPERATED LIKE THIS FROM
                          JUNE 8 UNTIL JUNE 29 WITH RESULTS THAT INDICATED SLIGHTLY REDUCED REMOVAL
                          EFFICIENCIES.  DURING THE 21 DAYS OF OPERATION THE UNIT WAS DOWN ONLY
                          ONCE FOR NINE HOURS FOR ROUTINE INSPECTION.
```

GULF POWER: SCHOLZ 1,2 (CONT.)

```
-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                                    DURING THE EPRI STUDY A TOTAL OF 4448 HOURS OF OPERATION WERE LOGGED WITH
                                    A TOTAL OF 123.3 HOURS OF SHUTDOWN.  THE AVERAGE AVAILABILITY FOR SIX
                                    MONTHS WAS 99.53%.
                                    ALL STUDIES WERE COMPLETED AND THE SYSTEM HAS BEEN TERMINATED.
```

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	GULF POWER	
PLANT NAME	SCHOLZ	
UNIT NUMBER	2A	
CITY	SNEADS	
STATE	FLORIDA	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	80	
GROSS UNIT GENERATING CAPACITY - MW	48	
NET UNIT GENERATING CAPACITY W/FGD - MW	40	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	48	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	146.1	(295 F)
STACK HEIGHT - M	******	(**** FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	3.50	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	0.15 MAX.	

*** PARTICLE CONTROL

** MECHANICAL COLLECTOR

NUMBER	0
TYPE	NONE

** ESP

NUMBER	1

** PARTICLE SCRUBBER

GENERIC TYPE	NONE
SPECIFIC TYPE	N/A

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	DRY ADSORPTION
PROCESS TYPE	ACTIVATED CARBON
SYSTEM SUPPLIER	FOSTER WHEELER/BERGBAU
DEVELOPMENT LEVEL	DEMONSTRATION
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.70
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	74.50
CURRENT STATUS	8
TERMINATION	2/76
COMMERCIAL START-UP	2/76
INITIAL START-UP	8/75
CONTRACT AWARDED	1/73

GULF POWER: SCHOLZ 2A (CONT.)

** DESIGN AND OPERATING PARAMETERS

** ABSORBER	
NUMBER	1
GENERIC TYPE	PACKED TOWER
SUPPLIER	FOSTER WHEELER/BERGBAU
** REHEATER	
NUMBER	0
GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE DEMONSTRATION SYSTEM AT SCHOLZ 2A CONSISTED OF A 20-MW ADSORBER SECTION AND A 47.5 MW REGENERATION AND REDUCTION SECTION. THE 20 MW ADSORBER WAS DESIGNED TO HANDLE 50% OF THE MAXIMUM FLUE GAS FLOW. THE PURPOSE OF THE ADSORPTION SECTION OF THE DRY REMOVAL SYSTEM WAS TO REMOVE SULFUR DIOXIDE; NITROGEN OXIDES, AND PARTICLE MATTER FROM THE FLUE GAS WITH ACTIVATED CHAR, CONVERTING THE CAPTURED POLLUTANTS TO SULFURIC ACID. THE REGENERATION SECTION PROVIDED CONTINUOUS ON-SITE REGENERATION OF THE CHAR, WHICH WAS LOADED WITH SULFUR DIOXIDE IN THE FORM OF SULFURIC ACID. THE REGENERATED CHAR AND A LOW VOLUME, SULFUR DIOXIDE-RICH OFF-GAS STREAM WAS FED TO A RESOX REACTOR, WHICH REDUCED THE SULFUR DIOXIDE STREAM TO GASEOUS ELEMENTAL SULFUR THAT WAS COLLECTED AND STORED IN AN INSULATED TANK.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/75	SYSTEM							720			
7/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

COMPLETION OF CONSTRUCTION WAS FOLLOWED BY A THREE MONTH COMMISSIONING PERIOD DURING WHICH VARIOUS PIECES OF EQUIPMENT WERE OPERATED INDIVIDUALLY AND THEN IN COMBINATIONS TO SIMULATE SUBSYSTEM OPERATION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

SUBSYSTEM OPERATIONS WERE INTEGRATED INTO SECTION OPERATIONS AND FLUE GAS WAS PASSED THROUGH THE ABSORBER AND REGENERATOR FOR A TEN DAY PERIOD BEGINNING AUGUST 11. RESOX CONSTRUCTION WAS INCOMPLETE AT THIS TIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/75	SYSTEM							720			
10/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER TWO CONSECUTIVE RUNS WERE CONDUCTED ON THE RESOX PORTION OF THE SYSTEM ON FRONT-END PROCESS OFF-GAS AT FULL OPERATING TEMPERATURES. THIS OPERATIONAL PERIOD LASTED FIVE DAYS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/75	SYSTEM							720			
12/75	SYSTEM							744			
1/76	SYSTEM							744			

GULF POWER: SCHOLZ 2A (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

A PROGRAM OF MODIFICATIONS ON THE SYSTEM BEGAN IN LATE AUGUST 1975 AND CONTINUED THROUGH JANUARY 1976, WITH THE EXCEPTION OF FIVE DAYS OF RESOX OPERATION IN OCTOBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/76	SYSTEM							696			

** PROBLEMS/SOLUTIONS/COMMENTS

MODIFICATIONS WERE COMPLETED AND PRE-STARTUP TESTING WAS CONDUCTED IN LATE JANUARY AND EARLY FEBRUARY. A THREE DAY CONTINUOUS RUN WAS SUCCESSFULLY COMPLETED.

DURING FEBRUARY THE MATERIALS HANDLING LOOPS AND THE RESOX LOOPS WERE OPERATED AT FULL OPERATING TEMPERATURES AND PRESSURES. REINTRODUCTION OF FLUE GAS INTO THE SYSTEM COMMENCED, AND A FOUR MONTH FORMAL TEST PROGRAM CONDUCTED BY SOUTHERN SERVICES AND FOSTER WHEELER BEGAN.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/76	SYSTEM							744			
4/76	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THREE OPERATIONAL PERIODS WERE LOGGED BY THE PROTOTYPE SYSTEM DURING MARCH AND APRIL. THE RESOX SECTION OPERATED INTERMITTENTLY BECAUSE OF PLUGGING PROBLEMS IN THE SULFUR CONDENSER. ALSO, THE FRONT END OF THE SYSTEM WAS TAKEN OUT OF SERVICE AT ONE POINT DUE TO FREQUENT HIGH TEMPERATURE EXCURSIONS. THIS PROBLEM WAS CORRECTED BY MODIFYING SYSTEM OPERATING PROCEDURES. WORK BEGAN ON THE SOLUTION OF THE SULFUR CONDENSER PROBLEM.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/76	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM COMPLETED AN OPERATIONAL PERIOD IN EARLY MAY WHICH HAD COMMENCED ON APRIL 26. THE SYSTEM WAS TAKEN OUT OF SERVICE AT THIS POINT DUE TO THE DEPLETION OF CHAR SUPPLY, HIGH CHAR CONSUMPTION RATES DUE TO MECHANICAL ATTRITION AND TO CORRECT/MODIFY THE CHAR/SAND SCREEN SEPARATOR.

DURING MAY A DECISION WAS MADE TO PREMATURELY TERMINATE THE SYSTEM DEMONSTRATION PROGRAM RATHER THAN SHUT DOWN, DEBUG AND RESTART THE SYSTEM AGAIN. THE SYSTEM SUPPLIER WAS PURSUING ADDITIONAL FUNDING FOR THE CONTINUATION OF THE PROTOTYPE DEMONSTRATION PROGRAM.

COMPANY NAME	ILLINOIS POWER COMPANY	
PLANT NAME	WOOD RIVER	
UNIT NUMBER	4	
CITY	EAST ALTON	
STATE	ILLINOIS	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	774.	(1.800 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	651	
GROSS UNIT GENERATING CAPACITY - MW	110	
NET UNIT GENERATING CAPACITY W/FGD - MW	103	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	110	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	154.4	(310 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	******	
STACK TOP DIAMETER - M	*******	(***** FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - J/G	25121.	(10800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	10.00	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	4.30	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	3.10	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	

*** PARTICLE CONTROL

** MECHANICAL COLLECTOR

NUMBER	1

** FABRIC FILTER

NUMBER	0
TYPE	NONE

** ESP

NUMBER	1
SUPPLIER	RESEARCH-COTTRELL
PARTICLE REMOVAL EFFICENCY - %	99.6

** PARTICLE SCRUBBER

GENERIC TYPE	NONE
SPECIFIC TYPE	N/A

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	CATALYTIC OXIDATION
SYSTEM SUPPLIER	MONSANTO ENVIRO CHEM SYSTEMS
DEVELOPMENT LEVEL	DEMONSTRATION
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.90
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
CURRENT STATUS	8

```
    TERMINATION                                 **/74
    COMMERCIAL START-UP                         10/72
    INITIAL START-UP                             9/72
    CONTRACT AWARDED                             6/70

** DESIGN AND OPERATING PARAMETERS

** ABSORBER
    NUMBER                                       1
    GENERIC TYPE                                PACKED TOWER
    DIMENSIONS - FT                             30 FT DIA X 65 FT
    SHELL GENERIC MATERIAL                      CARBON STEEL
    SHELL SPECIFIC MATERIAL                     AISI 1110
    SHELL MATERIAL TRADE NAME/COMMON TYPE       N/A
    GAS CONTACTING DEVICE TYPE                  VANADIUM PENTOXIDE
    NUMBER OF CONTACTING ZONES                   8
    DISTANCE BETWEEN GAS CONTACTING ZONES - CM    30.5        (   12.0IN)
    GAS-SIDE PRESSURE DROP - KPA                   1.0        ( 4.0 IN-H2O)
    INLET GAS TEMPERATURE - C                    454.4        (  850 F)
    SO2 REMOVAL EFFICIENCY - %                    85.0

** ABSORBER
    NUMBER                                       1
    GENERIC TYPE                                PACKED TOWER
    SHELL GENERIC MATERIAL                      CARBON STEEL
    SHELL SPECIFIC MATERIAL                     AISI 1110
    SHELL MATERIAL TRADE NAME/COMMON TYPE       N/A
    LINER GENERIC MATERIAL                      INORGANIC
    LINER SPECIFIC MATERIAL                     ACID-RESISTANT BRICK & MORTAR
    LINER MATERIAL TRADE NAME/COMMON TYPE       PREFIRED BRICK
    INLET GAS TEMPERATURE - C                    121.1        (  250 F)

** MIST ELIMINATOR
    PRE-MIST ELIMINATOR/MIST ELIMINATOR         MIST ELIMINATOR
    NUMBER PER SYSTEM                            1
    GENERIC TYPE                                IMPINGEMENT
    SPECIFIC TYPE                               MESH
    TRADE NAME/COMMON TYPE                      KNITTED WIRE MESH PAD
    PRESSURE DROP - KPA                            4.5        (18.0 IN-H2O)
    CONSTRUCTION MATERIAL GENERIC TYPE          HIGH ALLOY

** REHEATER
    NUMBER                                       1
    GENERIC TYPE                                IN-LINE
    PERCENT GAS BYPASSED - AVG                    14.5
    TEMPERATURE INCREASE - C                     230.0        (  446 F)
    INLET FLUE GAS TEMPERATURE - C               176.7        (  350 F)

** FANS
    NUMBER                                       1
    APPLICATION                                 INDUCED DRAFT

** FANS
    CONSTRUCTION MATERIAL GENERIC TYPE          STAINLESS STEEL

** DUCTWORK
      LINER GENERIC MATERIAL TYPE               STAINLESS STEEL

** TANKS
    SERVICE                                     NUMBER
    -------                                     ------
    PRODUCT ACID                                   2

** PUMPS
    SERVICE                                     NUMBER
    -------                                     ------
    ACID RECIRCULATION                          ****
    PRODUCT ACID                                ****
```

ILLINOIS POWER COMPANY: WOOD RIVER 4 (CONT.)

** SOLIDS CONCENTRATING/DEWATERING
NUMBER 0

** PROCESS CONTROL AND INSTRUMENTATION
CHEMICAL PARAMETERS TEMPERATURE, ASH LOADINGS, ACID CONCENTRATION

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
9/72	SYSTEM				33.9			720		244	

** PROBLEMS/SOLUTIONS/COMMENTS

THE EMISSION CONTROL EQUIPMENT AT THE WOOD RIVER SITE INCLUDED MECHANICAL COLLECTORS, A HIGH EFFICIENCY ESP, AND A MONSANTO CATALYTIC OXIDATION (CATOX) FGD SYSTEM FOR THE CONTROL OF PARTICLE MATTER AND SULFUR DIOXIDE. FOLLOWING PASSAGE THROUGH THE PARTICLE MATTER REMOVAL SYSTEM, THE FLUE GAS ENTERED THE SCRUBBING SYSTEM AND WAS HEATED TO A TEMPERATURE OF 850F AND THEN PASSED THROUGH A VANADIUM PENTOXIDE FIXED-BED CATALYTIC CONVERTER, WHERE THE SULFUR DIOXIDE WAS OXIDIZED TO SULFUR TRIOXIDE. THE GAS THEN FLOWED THROUGH AN ACID ABSORPTION TOWER, WHERE THE SULFUR TRIOXIDE IN THE GAS WAS CONVERTED TO SULFURIC ACID. AN ACID MIST ELIMINATOR ENSURED REMOVAL OF ENTRAINED ACID MIST FROM THE GAS STREAM. THE CLEANED GAS WAS DISCHARGED TO THE STACK AND THE PRODUCT ACID WAS COOLED AND STORED IN TANKS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
10/72	SYSTEM				23.9			744		178	

** PROBLEMS/SOLUTIONS/COMMENTS

THE WOOD RIVER SYSTEM WAS STARTED-UP IN SEPTEMBER 1972 BUT WAS SHUTDOWN ALMOST IMMEDIATELY (IN OCTOBER) TO CONVERT THE BURNERS TO OIL FIRING.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
7/73	SYSTEM				21.2			744		158	

** PROBLEMS/SOLUTIONS/COMMENTS

IN JUNE 1973 THE CONVERSION TO OIL FIRING WAS COMPLETED AND A SUCCESSFUL PERFORMANCE TEST WAS MADE. A CATALYST PLUGGING HAZARD CAUSED THE SYSTEM TO SHUTDOWN AGAIN TO INSTALL AN EXTERNAL BURNER SYSTEM.

IN APRIL 1974 THE INSTALLATION OF THE EXTERNAL BURNERS WAS COMPLETED. VARIOUS OTHER PROBLEMS OCCURRED, WITH THE RESULT THAT ONLY 657 HOURS OF OPERATING TIME WAS LOGGED IN TWO YEARS.

SEVERAL OTHER MAJOR PROBLEM AREAS ENCOUNTERED DURING THE INTERMITTENT OPERATION OF THIS REGENERABLE SYSTEM INCLUDED: FROZEN DAMPERS ON REHEAT BURNERS, CRACKS IN THE TEFLON LINER ON THE ACID PUMP'S DISCHARGE HEADER CRACKS IN THE REHEAT DUCTING, FALL OF REFRACTORY BRICKS FROM THE REHEATER BURNER DOME, AND NEED FOR REINFORCEMENT OF THE STRUCTURE SUPPORTING THE HIGH TEMPERATURE FLUEGAS DUCT TO THE CATALYTIC CONVERTER.

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	KEY WEST UTILITY BOARD	
PLANT NAME	STOCK ISLAND	
UNIT NUMBER	1	
CITY	KEY WEST	
STATE	FLORIDA	
REGULATORY CLASSIFICATION	******	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	473.	(1.100 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	42	
GROSS UNIT GENERATING CAPACITY - MW	42	
NET UNIT GENERATING CAPACITY W/FGD - MW	37	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	37	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	ERIE CITY	
BOILER TYPE	OIL FIRED	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	********	(******* ACFM)
BOILER FLUE GAS TEMPERATURE - C	*******	(**** F)
STACK HEIGHT - M	34.	(110 FT)
STACK SHELL	GUNNITE	
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	OIL	
FUEL GRADE	NO. 6	
AVERAGE HEAT CONTENT - J/G	******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	.04	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	2.01	
RANGE SULFUR CONTENT - %	2-3	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	1	
PRESSURE DROP - KPA	.6	(3. IN-H2O)
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	ZURN AIR SYSTEM	
DEVELOPMENT LEVEL	DEMONSTRATION	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	90.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00	
CURRENT STATUS	8	

KEY WEST UTILITY BOARD: STOCK ISLAND 1 (CONT.)

TERMINATION	**/75
INITIAL START-UP	10/72

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	2	
GENERIC TYPE	VENTURI TOWER	
SUPPLIER	ZURN AIR SYSTEMS	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 304L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	SCRUBBING TUBE	
LIQUID RECIRCULATION RATE - LITER/S	25.	(400 GPM)
GAS-SIDE PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
INLET GAS FLOW - CU. M/S	58.04	(123000 ACFM)
INLET GAS TEMPERATURE - C	62.8	(145 F)

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	CURVED DEFLECTOR PLATE
TRADE NAME/COMMON TYPE	GULL WING
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBERGLASS

** REHEATER

NUMBER	0
GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A

** FANS

NUMBER	1
APPLICATION	INDUCED DRAFT

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	POND

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	TEMPERATURE, PARTICLE LOADING, PH

** WATER BALANCE

WATER LOOP TYPE	OPEN

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/73	SYSTEM		3.6					744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE EMISSION CONTROL SYSTEM AT THE STOCK ISLAND PLANT CONSISTED OF A MULTIPLE TUBE MECHANICAL COLLECTOR INSTALLED UPSTREAM OF TWO SULFUR DIOXIDE WET SCRUBBERS. THIS DEMONSTRATION FACILITY EMPLOYED LIMESTONE IN A SEAWATER SOLUTION FOR THE REMOVAL OF SO2. THE LIMESTONE ABSORBENT WAS OBTAINED FROM CORAL DREDGED FROM THE OCEAN. THE CORAL CONSISTED PRIMARILY OF CACO3 WITH LITTLE OR NO MGCO3. THE CORAL WAS GROUND TO A FINE POWDER IN A HAMMERMILL CRUSHER TO 90% MINUS 325 MESH AND SLURRIED IN SEAWATER.

PERFORMANCE DATA

THE SCRUBBING SYSTEM WAS SCHEDULED TO START UP IN JULY 1972, BUT DID NOT OPERATE UNTIL AUGUST 1973. DURING THE INTERIM, THE PRIMARY CRUSHING SYSTEM BECAME FROZEN BECAUSE OF SALT AIR CORROSION TAKING PLACE FROM DISUSE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/73	SYSTEM		.0					720			
10/73	SYSTEM		4.6					744			
11/73	SYSTEM		5.8					720			
12/73	SYSTEM		9.7					744			

** PROBLEMS/SOLUTIONS/COMMENTS

FROM STARTUP IN AUGUST 1973 UNTIL DECEMBER 10, 1973 THE LONGEST SCRUBBER RUN WAS FIVE DAYS; ASIDE FROM THAT, THE SCRUBBER WAS UP AND DOWN ONE DAY AT A TIME FOR SHAKEDOWN TESTING.

ON DECEMBER 12 A HIGH PRESSURE DROP (15 IN. H2O) CAUSED THE SCRUBBER TO SHUTDOWN.

A CHANGE IN THE BOILER LOAD, PROBLEMS WITH THE GRID, AND A HIGH PRESSURE DROP CAUSED THE SYSTEM TO SHUTDOWN ON DECEMBER 17. THE SYSTEM REMAINED DOWN THROUGH THE END OF THE MONTH SO THE SYSTEM COULD BE CLEANED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/74	SYSTEM		33.5					744			

** PROBLEMS/SOLUTIONS/COMMENTS

ON JANUARY 2 THE 1A SCRUBBER EXPERIENCED PLUGGING CAUSING THE SYSTEM TO SHUTDOWN.

A HIGH PRESSURE DROP CAUSED SOME OUTAGE TIME IN JANUARY.

THE ENTIRE PLANT SHUTDOWN FOR SEVEN DAYS DURING JANUARY DUE TO A MAIN BEARING FAILURE.

THE HIGH PRESSURE ALARM AND THE SENSING DEVICE TRIPPED DUE TO SLUDGE BUILDUP. THIS KEPT THE SYSTEM OUT OF SERVICE FOR APPROXIMATELY FOUR DAYS.

ON JANUARY 22 THE SYSTEM WAS TAKEN OUT OF SERVICE FOR ABOUT THREE HOURS DUE TO A RUPTURED LINE ON ONE OF THE PUMPS AND A DECREASE IN THE PRESSURE DROP. CORRODED LOOSE NUTS AND BOLTS WERE FOUND IN THE LINE.

ON JANUARY 28 THE SYSTEM WAS SHUTDOWN FOR MODIFICATIONS WHICH INCLUDED; REPLACEMENT OF THE CYCLONE BY A BAGHOUSE AND REPLACEMENT OF THE VIBRATORY FEEDER BY A SCREW FEEDER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/74	SYSTEM		.0					672			
3/74	SYSTEM		.0					744			
4/74	SYSTEM		.0					720			
5/74	SYSTEM		.0					744			
6/74	SYSTEM		.0					720			
7/74	SYSTEM		.0					744			
8/74	SYSTEM		4.4					744			
9/74	SYSTEM		.0					720			

KEY WEST UTILITY BOARD: STOCK ISLAND 1 (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
10/74	SYSTEM		37.5					744			
11/74	SYSTEM		43.1					720			
12/74	SYSTEM		16.1					744			
1/75	SYSTEM		.0					744			

** PROBLEMS/SOLUTIONS/COMMENTS

AFTER STARTUP IN AUGUST 1973, ENSUING OPERATION PROCEEDED ON AN INTERMITTENT BASIS. THE MAJOR PROBLEM AREAS ENCOUNTERED INCLUDED:

*SEVERE CORROSION OF THE GAS QUENCH DUCT AND DAMPER SEALING FANS ON THE INLET AND OUTLET OF THE SCRUBBERS
*PLUGGING AT THE BOTTOM OF THE SCRUBBER TUBES
*LIQUID LEVEL CONTROL FAILURES IN THE SCRUBBER MODULES
*POOR LIMESTONE UTILIZATION (APPROXIMATELY 20%)
*INDUCED DRAFT FAN REPAIRS
*REPLACEMENT OF INTERNAL STAINLESS STEEL PARTS WITH MONEL COMPONENTS
*BOILER FOUNDATION AND BOILER TUBE PROBLEMS
*LIMESTONE SUPPLY SHORTAGES

AS OF MARCH 1977 IT HAD NOT BEEN DECIDED WHETHER THERE WOULD BE FUTURE FGD OPERATIONS AT THE STOCK ISLAND PLANT. DURING OPERATION THE SCRUBBING SYSTEM LOGGED 1579 HOURS FOR A TOTAL OPERABILITY OF 8%.

SECTION 16

DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

COMPANY NAME	PHILADELPHIA ELECTRIC	
PLANT NAME	EDDYSTONE	
UNIT NUMBER	1A	
CITY	EDDYSTONE	
STATE	PENNSYLVANIA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	******	(****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1395	
GROSS UNIT GENERATING CAPACITY - MW	120	
NET UNIT GENERATING CAPACITY W/FGD - MW	120	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****	
EQUIVALENT SCRUBBED CAPACITY - MW	120	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	******	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	437.45	(927000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	157.2	(315 F)
STACK HEIGHT - M	76.	(249 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.6	(18.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	31634.	(13600 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		******
AVERAGE ASH CONTENT - %	9.40	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	5.90	
RANGE MOISTURE CONTENT - %	******	
AVERAGE SULFUR CONTENT - %	2.60	
RANGE SULFUR CONTENT - %	******	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	1	
** ESP		
NUMBER	1	
** PARTICLE SCRUBBER		
NUMBER	2	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/VERTICALLY-ADJUSTABLE ROD DECKS	
SUPPLIER	ENVIRONEERING	
DIMENSIONS - FT	14 X 25 X 53 HIGH	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
NUMBER OF CONTACTING ZONES	1	
L/G RATIO - LITER/CU.M	.6	(4.8 GAL/1000ACF)
PRESSURE DROP - KPA	.0	(.1 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	145.8	(309000 ACFM)
INLET GAS TEMPERATURE - C	157.2	(315 F)
** PARTICLE SCRUBBER		
NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/ADJUSTABLE DRUM	
SUPPLIER	PEABODY-LURGI	
DIMENSIONS - FT	14 X 25 X 53 HIGH	

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
NUMBER OF CONTACTING ZONES	1	
L/G RATIO - LITER/CU.M	.6	(4.8 GAL/1000ACF)
PRESSURE DROP - KPA	.0	(.1 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	145.8	(309000 ACFM)
INLET GAS TEMPERATURE - C	157.2	(315 F)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	MAGNESIUM OXIDE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	UNITED ENGINEERS
A-E FIRM	UNITED ENGINEERS & CONSTRUCTORS
DEVELOPMENT LEVEL	DEMONSTRATION
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
CURRENT STATUS	8
TERMINATION	**/79
COMMERCIAL START-UP	9/75
INITIAL START-UP	9/75

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	1	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	GRID PACKING	
SUPPLIER	ENVIRONEERING, RILEY STOKER	
DIMENSIONS - FT	14 X 25 X 53	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	HIGH STRENGTH LOW ALLOY	
SHELL MATERIAL TRADE NAME/COMMON TYPE	COR-TEN	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	POLYURETHANE	
GAS CONTACTING DEVICE TYPE	ROD DECKS	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	843.	(13364 GPM)
L/G RATIO - L/CU.M	6.5	(48.5 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.5	(10.0 IN-H2O)
INLET GAS FLOW - CU. M/S	126.47	(268000 ACFM)
INLET GAS TEMPERATURE - C	51.7	(125 F)

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	2	
FREEBOARD DISTANCE - M	2.44	(8.0 FT)
CONSTRUCTION MATERIAL GENERIC TYPE	FIBERGLASS	
WASH WATER SOURCE	STRAINED RIVER WATER	

** REHEATER

NUMBER	1	
GENERIC TYPE	DIRECT COMBUSTION	
SPECIFIC TYPE	IN-LINE BURNER	
TRADE NAME/COMMON TYPE	OIL	
TEMPERATURE INCREASE - C	39.4	(103 F)
INLET FLUE GAS TEMPERATURE - C	51.7	(125 F)

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

** FANS

NUMBER	3
SUPPLIER	BUFFALO FORGE
FUNCTION	BALANCED DRAFT
APPLICATION	INDUCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	126.47 (268000 ACFM)
FLUE GAS TEMPERATURE - C	107.2 (225 F)
CONSTRUCTION MATERIAL GENERIC TYPE	316L SS WITH CARPENTER 20 HUB

** DUCTWORK

LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	316L SS
LINER GENERIC MATERIAL TYPE	NONE

** DUCTWORK

LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	316L SS
LINER GENERIC MATERIAL TYPE	NONE

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	2

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
DIMENSIONS - FT	40 DIA
OUTLET STREAM CHARACTERISTICS	25% SOLIDS

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	CENTRIFUGE
NUMBER	1

** WATER BALANCE

WATER LOOP TYPE	OPEN
MAKEUP WATER ADDITION - LITERS/S	8.3 (132 GPM)

** FGD SPARE CAPACITY INDICES

ABSORBER - %	.0

** FGD SPARE COMPONENT INDICES

ABSORBER	.0

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/74	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM AT THIS PLANT CONSISTS OF THREE PARALLEL SCRUBBING TRAINS INCORPORATING THREE WET PARTICULATE SCRUBBERS AND ONE SO2 ABSORBER MODULE. THERE WAS A BRIEF OPERATING PERIOD ON THE PARTICULATE SCRUBBERS FROM MID-NOVEMBER 1974 TO MARCH 1975. PROBLEMS ENCOUNTERED CENTERED AROUND THE SCRUBBER BOOSTER FANS AND THE FLUE GAS AND LIQUID CONDITIONS. THE B-SIDE BOOSTER FAN DEVELOPED HIGH SHAFT VIBRATION WHEN STARTED FOR THE FIRST TIME. THIS PROBLEM WAS DESIGN-RELATED, INVOLVING AN EXCESSIVE CLEARANCE AREA BETWEEN THE SHAFT AND WHEELHUB. ALSO, EXTENSIVE CORROSION DEVELOPED IN THE C-SIDE PARTICLE SCRUBBER INTERNALS. THIS WAS CAUSED BY LOW SCRUBBING SOLUTION PH LEVELS AND CHLORIDE LEVELS AS HIGH AS 2000 PPM. THESE CONDITIONS COUPLED WITH THE THERMAL SHOCK OF A HOT START PROCEDURE CAUSED THE CORROSION. THIS PROBLEM WAS AMELIORATED BY CAUSTIC ADDITION, HIGHER BLOWDOWN AND EMPLOYING A COLD START PROCEDURE. AT APPROXIMATELY THIS TIME, A CHECKOUT OF THE SO2 SYSTEM WAS CONDUCTED. BLISTERING AND

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

PERFORMANCE DATA

PEELING OF THE POLYURETHANE COATINGS WERE DETECTED AND CORRECTED BY RECOATING WITH FLAKEGLASS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/74	SYSTEM							744			
1/75	SYSTEM							744			
2/75	SYSTEM							672			
3/75	SYSTEM							744			
4/75	SYSTEM							720			
5/75	SYSTEM							744			
6/75	SYSTEM							720			
7/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE C-SIDE PARTICULATE SCRUBBER RESTARTED ON JULY 23, 1975. THE TWO OTHER TRAINS, B-SIDE AND A-SIDE, WERE PUT INTO OPERATION ON AUGUST 15 AND OCTOBER 2, RESPECTIVELY. THE SO2 ABSORBER MODULE IN THE C-SIDE SCRUBBING TRAIN WAS INITIALLY PLACED IN SERVICE OCTOBER 2, 1975. THE OLIN CHEMICAL MGO REGENERATION FACILITY FIRST PROCESSED MAGNESIUM SULFITE FROM THE EDDYSTONE SCRUBBER ON OCTOBER 28, 1975. THE C-SIDE PARTICULATE SCRUBBER OPERATED A TOTAL OF 2831 HOURS THROUGH JANUARY 31, 1976, FOR AN OPERABILITY OF 70%. THE B-SIDE TRAIN HAS OPERATED A TOTAL OF 1933 HOURS THROUGH JANUARY 31, 1976 FOR AN OPERABILITY OF 55%. THE A-SIDE TRAIN OPERATED A TOTAL OF 626 HOURS THROUGH JANUARY 31, 1976, FOR AN OPERABILITY OF 24%. THE C-SIDE SO2 ABSORBER WAS IN SERVICE A TOTAL OF 556 HOURS THROUGH DECEMBER 31, 1975, WITH AN OPERABILITY OF 33% SINCE START UP. PROBLEMS ENCOUNTERED IN THE OPERATION OF THE THREE SCRUBBING TRAINS INCLUDED UNDER-DESIGNED RECIRCULATION PUMPS, MALFUNCTION OF THE FLUE GAS BY-PASS DAMPER DRIVE UNITS AND FAILURE OF THE DOUBLE-BRICK REFRACTORY LINING IN THE REHEAT COMBUSTION CHAMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/75	SYSTEM							744			
9/75	SYSTEM							720			
10/75	SYSTEM							744			
11/75	SYSTEM							720			
12/75	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATION OF THE SO2 SCRUBBING SYSTEM AT EDDYSTONE WAS TEMPORARILY HALTED BECAUSE THE ACID PLANT REGENERATION FACILITY AT THE OLIN CHEMICAL SULFURIC ACID PLANT IN PAULSBORO, NEW JERSEY PERMANENTLY CEASED OPERATIONS. THE UTILITY WAS INVESTIGATING ALTERNATIVE REGENERATION SITES. A MINIMUM PERIOD OF SIX MONTHS WAS REQUIRED FOR RELOCATION ONCE A CHOICE WAS MADE. THE UTILITY ANNOUNCED PLANS FOR RELOCATION OF THE REGENERATION FACILITY AT THE ESSEX CHEMICAL PLANT IN NEWARK, NEW JERSEY.

THE PARTICULATE SCRUBBERS WERE CONTINUING TO OPERATE AND THESE UNITS WEREARE CONTINUING TO EXPERIENCE PROBLEMS WITH THE FANS, REHEAT BURNERS, DAMPERS AND EXPANSION JOINTS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/76	SYSTEM							744			
2/76	SYSTEM							696			

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/76	SYSTEM							744			
4/76	SYSTEM							720			
5/76	SYSTEM							744			
6/76	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

RESUMPTION OF SO2 SCRUBBING OPERATIONS WAS SCHEDULED FOR DECEMBER 1976. THE RELOCATION OF THE REGENERATION FACILITY WAS IN PROGRESS. THE PARTICULATE SCRUBBERS WERE OPERATIONAL. THE C-SIDE BOOSTER FAN DEVELOPED A MATERIALS FAILURE BETWEEN THE HUB AND SHAFT (IDENTICAL TO THE B-SIDE UNIT MENTIONED EARLIER).

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/76	SYSTEM							744			
8/76	SYSTEM							744			
9/76	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

ALL THREE BOOSTER FANS DOWNSTREAM OF THE REHEATERS DEVELOPED MATERIALS FAILURE BETWEEN THE HUB AND SHAFT (AS IDENTIFIED EARLIER FOR THE B-SIDE UNIT). THESE UNITS WERE RETURNED TO THE MANUFACTURER FOR MODIFICATIONS AND REPAIRS. ONE OF THE PARTICULATE SCRUBBERS WAS IN THE FLUE GAS STREAM. TO DATE, THE THREE WET PARTICULATE SCRUBBERS HAD ACHIEVED LITTLE SIMULTANEOUS SERVICE TIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/76	SYSTEM							744			
11/76	SYSTEM							720			
12/76	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

MGO SCRUBBING OPERATIONS WERE SCHEDULED TO RESTART IN MAY 1977. REGENERATION FACILITY RELOCATION WAS BEING COMPLETED, AND MODIFICATIONS TO THE ID BOOSTER FANS BEING EFFECTED CONSISTED OF CONVERSION FROM A SLIP FIT TO A SHRINK FIT. THESE MODIFICATIONS WERE EXPECTED TO ELIMINATE RECURRING VIBRATION PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/77	SYSTEM							744			
2/77	SYSTEM							672			
3/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE MGO SCRUBBING SYSTEM AT EDDYSTONE 1A WAS STILL SCHEDULED FOR RESTART IN MAY 1977. THE START-UP OF THE NEW MAGNESIUM SULFITE REGENERATION FACILITY AT THE ESSEX CHEMICAL PLANT AT NEWARK, N.J. WAS ALSO SCHEDULED FOR MAY 1977. THE THREE PARALLEL VENTURI SCRUBBERS CONTROLLING PARTICULATE EMISSIONS ON EDDYSTONE 1 WENT BACK INTO SERVICE IN MARCH 1977.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/77	SYSTEM							720			
5/77	SYSTEM							744		206	

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

RESUMPTION OF MAGNESIUM OXIDE SCRUBBING OPERATIONS OCCURRED DURING THE REPORT PERIOD. THE UTILITY REPORTED THAT SO2 SCRUBBING OPERATIONS WERE NOT CONTINUOUS THROUGHOUT THE PERIOD. THE ABSORBER WAS IN SERVICE APPROXIMATELY 206 HOURS DURING MAY. REGENERATION OPERATIONS AT THE ESSEX FACILITY WERE NOT CONDUCTED DURING THE PERIOD. PECO PLANNED TO INITIATE SO2 RECOVERY AND MAGOX REGENERATION OPERATIONS DURING THE MONTH OF JUNE. THE SO2 MODULE CONTAINED TWO ABSORBER SECTIONS IN SERIES (EACH SECTION CONSISTING OF AN ADJUSTABLE ROD DECK WITH UNDERSPRAYS). ONLY ONE OF THE ABSORBER SECTIONS WAS BEING USED FOR SO2 REMOVAL. SO2 REMOVAL EFFICIENCY WAS NOT MEASURED. MAGNESIUM OXIDE LOSSES IN THE SYSTEM (ABSORPTION AND REGENERATION) WERE ESTIMATED AT 10%.

6/77	SYSTEM							720			
7/77	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

FAILURE OF MINOR ANCILLIARY EQUIPMENT CAUSED SOME SCRUBBER SHUTDOWNS. LATER, THE BOILER ITSELF WAS SHUT DOWN. OVER THIS PERIOD THE ROTARY VALVE ON THE MAG SULFITE DRIER DISCHARGE PLUGGED REPEATEDLY. ALSO THE BELTS ON THE AGITATOR OF THE MAG-OX PRESLAKER FAILED.

8/77	SYSTEM							744			
9/77	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE ROTARY VALVE PROBLEM APPEARED TO BE SOLVED. CUMULATIVE OPERABILITY SINCE MAY WAS ESTIMATED TO BE ROUGHLY 33%. PECO REPORTED 131 HOURS OF CONTINUOUS OPERATION FOR THE SCRUBBER AND THICKENER CENTRIFUGE DRYING LOOP. DURING THE AUGUST-SEPTEMBER REPORT PERIOD CONTINUAL PROBLEMS WITH THE GLAND PACKING ON THE FGD SYSTEM CIRCULATION PUMPS (STUFFING BOX) WERE ENCOUNTERED. PECO CHANGED THE GLAND CONFIGURATION. THERE ALSO WAS A PROBLEM WITH HIGH SOLIDS FORMATION IN THE THICKENER.

10/77	SYSTEM		41.0					744			
11/77	SYSTEM		41.0					720			

** PROBLEMS/SOLUTIONS/COMMENTS

CUMULATIVE OPERABILITY FOR MAY THROUGH NOVEMBER 1977 WAS 39%. DURING THE OCTOBER-NOVEMBER PERIOD THE FGD SYSTEM ACHIEVED A 213 HOUR CONTINUOUS RUN. THIS WAS THE LONGEST CONTINUOUS RUN SINCE MAY 1977.

GLAND PACKING PROBLEMS PERSISTED AND MECHANICAL SEALS WERE BEING CONSIDERED AS POSSIBLE ALTERNATIVES. EVEN WITH HEAT TRACING THE SEAL WATER FROZE-UP CAUSING ROTAMETERS TO BURST. HIGH SOLIDS ACCUMULATION IN THE THICKENER WAS STILL A PROBLEM AREA.

12/77	SYSTEM		41.0					744			
1/78	SYSTEM							744		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN DECEMBER 22 FOR A TURBINE OVERHAUL. DURING THE OUTAGE MAINTENANCE AND MINOR MODIFICATIONS WERE BEING MADE ON THE SCRUBBERS. THE UNIT WAS EXPECTED TO BE BACK ON LINE THE FIRST WEEK IN MARCH.

PERFORMANCE DATA

THE CUMULATIVE OPERABILITY FACTOR FOR THE FOURTH QUARTER OF 1978 WAS 41%. DURING THIS PERIOD SOME OF THE HEAT TRACING FAILED AND OTHER PROBLEMS OCCURRED WHEN LINES FROZE AT THE ACID PLANT CAUSING THE FACILITY TO BE OPERATED INTERMITTENTLY. THE GLAND PACKING PROBLEMS HAD NOT BEEN SOLVED AND MECHANICAL SEALS WERE STILL BEING CONSIDERED.

THE UTILITY WAS STUDYING THE MAG-SULFIDE TO MAG-OXIDE RECOVERY EFFICIENCY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/78	SYSTEM				.0			672		0	
3/78	SYSTEM				.0			744		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE TURBINE OVERHAUL CONTINUED DURING THE FEBRUARY-MARCH PERIOD. DURING THE SHUTDOWN PERIOD IT WAS FOUND THAT SOME HIGH PRESSURE STEAM TUBES WERE CRACKED, SO UNIT MAINTENANCE TOOK LONGER THAN EXPECTED. SOME MINOR FGD SYSTEM MODIFICATIONS WERE INCORPORATED IN THE COURSE OF THE SHUTDOWN PERIOD. START UP WAS EXPECTED IN MID-APRIL 1978.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/78	SYSTEM				.0			720		0	
5/78	SYSTEM				.0			744		0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CAME BACK ON LINE JUNE 1 AFTER AN EXTENSIVE SYSTEM MODIFICATION OUTAGE WHICH BEGAN DECEMBER 22. THE UNIT WAS EXPECTED BACK ON LINE IN MID-APRIL, BUT THERE WAS A PROBLEM WITH A SUPER PRESSURE STEAM TURBINE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/78	SYSTEM		49.0					720			
7/78	SYSTEM		51.0					744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE FGD SYSTEM ACHIEVED A 49% OPERABILITY. OPERABILITY FOR JULY WAS 51%. PROBLEMS OCCURRED IN LATE JUNE WITH THE MGSO3 SLURRY CIRCULATION PUMP WHEN THE UTILITY DISCOVERED THE RUBBER LINER WAS TORN AWAY. THERE WERE SOME PROBLEMS WITH THE MGO SECTION WHERE THE MGO MIXES WITH THE SYSTEM LIQUOR. FIRE BRICK WAS REMOVED FROM THE FLUID BED REACTOR CHAMBER TO REPLACE THE ACID BARRIER PLATES WHICH WERE FAILING. THE FIRE BRICK WAS THEN REPLACED. THE SLOW PIECE BY PIECE PROCEDURE WAS TIME CONSUMING AND ACCOUNTED FOR MOST OF THE REGENERABLE FACILTY DOWN TIME (MOST OF JUNE AND JULY). MAJOR PROBLEMS WERE SOLVED ON THE REGENERATIVE FACILITY OVER THE PERIOD RESULTING IN IMPROVED AVAILABILITY OF THE FACILITY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/78	SYSTEM		38.0		32.0			744	631	240	
9/78	SYSTEM		78.0		56.0			720	516	402	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF AUGUST SCRUBBER CIRCULATING PIPING PROBLEMS WERE ENCOUNTERED. A BUTTERFLY CONTROL VALVE WAS NOT FULLY OPEN AND A SECTION OF PIPE DOWNSTREAM AT A 90 DEGREE BEND ERODED AWAY. TO CORRECT THE PROBLEM THE BUTTERFLY VALVE WAS TAKEN OUT AND REPLACED WITH A RESTRICTION ORIFACE. THE CIRCULATION PUMPING RATE WAS ALSO REDUCED.

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF SEPTEMBER. CERTAIN MECHANICAL PROBLEMS WERE RESOLVED WHICH RESULTED IN AN IMPROVEMENT IN THE OPERABILITY FIGURE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/78	SYSTEM		23.0					744			

PHILADELPHIA ELECTRIC: EDDYSTONE 1A (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% SO2	REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/78	SYSTEM							720			
12/78	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUT DOWN FOR AN APPRECIABLE TIME DURING THE LAST QUARTER OF 1978 DUE TO MODIFICATIONS TO THE MGO SLAKING EQUIPMENT.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% SO2	REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/79	SYSTEM							744			
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			
5/79	SYSTEM							744			
6/79	SYSTEM							720			
7/79	SYSTEM							744			
8/79	SYSTEM							744			
9/79	SYSTEM							720			
10/79	SYSTEM							744			
11/79	SYSTEM							720			
12/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THIS UNIT HAD NOT BEEN AVAILABLE SINCE OCTOBER 1978.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% SO2	REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM							744	0		
2/80	SYSTEM							696	0		
3/80	SYSTEM							744	0		

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND TURBINE WERE DOWN DURING THE FIRST QUARTER 1980 FOR TURBINE MAINTENANCE.

OPERATION OF THIS PROTOTYPE MAGNESIUM OXIDE SYSTEM, WHICH TREATED ONE THIRD OF THE FLUE GAS FROM THE EDDYSTONE 1 BOILER, WAS TERMINATED. THE SO2 REMOVAL EQUIPMENT WILL BE REPLACED WITH A SIMILAR MAG-OX SYSTEM DESIGNED TO TREAT 100% OF THE BOILER FLUE GAS. THE EXPECTED START DATE OF THIS SYSTEM IS DECEMBER 1982. CURRENT REGULATIONS DO NOT REQUIRE CONTROL OF SO2 EMISSIONS UNTIL THE NEW SCRUBBER IS AVAILABLE FOR OPERATION.

```
COMPANY NAME                                  POTOMAC ELECTRIC POWER
PLANT NAME                                    DICKERSON
UNIT NUMBER                                   3A
CITY                                          DICKERSON
STATE                                         MARYLAND
REGULATORY CLASSIFICATION                     ******
PARTICULATE EMISSION LIMITATION - NG/J        ******         (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                 688.          ( 1.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              548
GROSS UNIT GENERATING CAPACITY - MW             190
NET UNIT GENERATING CAPACITY W/FGD - MW         178
NET UNIT GENERATING CAPACITY WO/FGD - MW        182
EQUIVALENT SCRUBBED CAPACITY - MW                95

 ** UNIT DATA - BOILER AND STACK
    BOILER SUPPLIER                           COMBUSTION ENGINEERING
    BOILER TYPE                               PULVERIZED COAL
    BOILER SERVICE LOAD                       BASE
    DESIGN BOILER FLUE GAS FLOW - CU.M/S        278.42       ( 590000 ACFM)
    BOILER FLUE GAS TEMPERATURE - C             126.1        ( 259 F)
    STACK HEIGHT - M                            122.         ( 400 FT)
    STACK SHELL                               ******
    STACK TOP DIAMETER - M                    *******        (***** FT)

 ** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                27214.         ( 11700 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                ******
    AVERAGE ASH CONTENT - %                      14.00
    RANGE ASH CONTENT - %                     ******
    AVERAGE MOISTURE CONTENT - %              ********
    RANGE MOISTURE CONTENT - %                6-7
    AVERAGE SULFUR CONTENT - %                    2.00
    RANGE SULFUR CONTENT - %                  ******
    AVERAGE CHLORIDE CONTENT - %              ********
    RANGE CHLORIDE CONTENT - %                ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
    NUMBER                                      0
    TYPE                                      NONE

 ** FABRIC FILTER
    NUMBER                                      0
    TYPE                                      NONE

 ** ESP
    NUMBER                                      1
    SUPPLIER                                  RESEARCH-COTTRELL
    PARTICLE REMOVAL EFFICENCY - %               97.5

 ** PARTICLE SCRUBBER
    GENERIC TYPE                              NONE
    SPECIFIC TYPE                             VARIABLE-THROAT/TOP-ENTRY PLUMB BOB

*** FGD SYSTEM

 ** GENERAL DATA
    SALEABLE PRODUCT/THROWAWAY PRODUCT        SALEABLE PRODUCT
    SO2 REMOVAL MODE                          WET SCRUBBING
    PROCESS TYPE                              MAGNESIUM OXIDE
    PROCESS ADDITIVES                         NONE
    SYSTEM SUPPLIER                           CHEMICO DIVISION, ENVIROTECH
    A-E FIRM                                  CHEMICO
    DEVELOPMENT LEVEL                         DEMONSTRATION
    NEW/RETROFIT                              RETROFIT
```

POTOMAC ELECTRIC POWER: DICKERSON 3A (CONT.)

UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.30	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
CURRENT STATUS	8	
TERMINATION	**/75	
COMMERCIAL START-UP	7/74	
INITIAL START-UP	9/73	
CONTRACT AWARDED	7/71	

** DESIGN AND OPERATING PARAMETERS

** ABSORBER

NUMBER	1	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
SUPPLIER	CHEMICO DIVISION, ENVIROTECH	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
L/G RATIO - L/CU.M	5.3	(40.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.2	(9.0 IN-H2O)
SO2 REMOVAL EFFICIENCY - %	90.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	MIST ELIMINATOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CHEVRON VANE	
NUMBER OF STAGES	3	
NUMBER OF PASSES PER STAGE	2	
DISTANCE BETWEEN VANES - CM	5.1	(2.00 IN)
VANE ANGLES - DEGREES	45	
PRESSURE DROP - KPA	.2	(1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	

** REHEATER

NUMBER	0
GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A

** FANS

NUMBER	1
FUNCTION	UNIT
SERVICE	WET
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY

** TANKS

SERVICE	NUMBER
******	1

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	2

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH, PRESSURE DROP
CONTROL LEVELS	PH-7; H2O-11"
MONITOR LOCATION	IN SECOND STAGE SYSTEM
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
0/75	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

REFER TO THE PERFORMANCE UPDATE INFORMATION FOR DICKERSON 3 LOCATED IN SECTION 14.

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

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COMPANY NAME                                    PUBLIC SERVICE OF COLORADO
PLANT NAME                                      VALMONT
UNIT NUMBER                                     5A
CITY                                            VALMONT
STATE                                           COLORADO
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J            43.           (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  ******          (****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                  ******          (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                274
GROSS UNIT GENERATING CAPACITY - MW               166
NET UNIT GENERATING CAPACITY W/FGD - MW           157
NET UNIT GENERATING CAPACITY WO/FGD - MW          163
EQUIVALENT SCRUBBED CAPACITY - MW                 166

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                            COMBUSTION ENGINEERING
     BOILER TYPE                                PULVERIZED COAL
     BOILER SERVICE LOAD                        BASE
     DESIGN BOILER FLUE GAS FLOW - CU.M/S         436.98        ( 926000 ACFM)
     BOILER FLUE GAS TEMPERATURE - C              126.7         ( 260 F)
     STACK HEIGHT - M                           ******          (**** FT)
     STACK SHELL                                ******
     STACK TOP DIAMETER - M                     *******         (***** FT)

 ** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 SUBBITUMINOUS
     AVERAGE HEAT CONTENT - J/G                 25121.          ( 10800 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                  ******
     AVERAGE ASH CONTENT - %                          6.00
     RANGE ASH CONTENT - %                      5.4-7.0
     AVERAGE MOISTURE CONTENT - %                    15.00
     RANGE MOISTURE CONTENT - %                 12.7-18.3
     AVERAGE SULFUR CONTENT - %                        .70
     RANGE SULFUR CONTENT - %                   0.68-.73
     AVERAGE CHLORIDE CONTENT - %               ********
     RANGE CHLORIDE CONTENT - %                 ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
     NUMBER                                     1
     INLET FLUE GAS CAPACITY - CU.M/S             218.5         ( 463000 ACFM)

 ** FABRIC FILTER
     NUMBER                                     0
     TYPE                                       NONE

 ** ESP
     NUMBER                                     1
     TYPE                                       COLD SIDE
     INLET FLUE GAS CAPACITY - CU.M/S             218.5         ( 463000 ACFM)

 ** PARTICLE SCRUBBER
     NUMBER                                     1
     GENERIC TYPE                               PACKED TOWER
     SPECIFIC TYPE                              MOBILE BED PACKING
     SUPPLIER                                   AIR CORRECTION DIVISION, UOP
     SHELL GENERIC MATERIAL                     CARBON STEEL
     SHELL SPECIFIC MATERIAL                    AISI 1110
     LINER GENERIC MATERIAL                     ORGANIC
     LINER SPECIFIC MATERIAL                    RUBBER
     GAS CONTACTING DEVICE TYPE                 STAINLESS STEEL, 1.5 INCH PLASTIC SPHERES
     NUMBER OF CONTACTING ZONES                   3
     L/G RATIO - LITER/CU.M                          7.8        (58.3 GAL/1000ACF)
     PRESSURE DROP - KPA                             3.7        (15.0 IN-H2O)
     SUPERFICIAL GAS VELOCITY - M/S                  3.4        (    11.0 FT/S)
     INLET GAS FLOW RATE - CU.M/S                  109.2        ( 231500 ACFM)
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EPA UTILITY FGD SURVEY: OCTOBER - DECEMBER 1980

PUBLIC SERVICE OF COLORADO: VALMONT 5A (CONT.)

    INLET GAS TEMPERATURE - C                        132.8        ( 271 F)
    SO2 REMOVAL EFFICENCY - %                         45.0
    PARTICLE REMOVAL EFFICIENCY - %                   96.0

*** FGD SYSTEM

 ** GENERAL DATA
    SALEABLE PRODUCT/THROWAWAY PRODUCT           THROWAWAY PRODUCT
    SO2 REMOVAL MODE                             WET SCRUBBING
    PROCESS TYPE                                 LIMESTONE/ALKALINE FLYASH
    PROCESS ADDITIVES                            NONE
    SYSTEM SUPPLIER                              UOP/PUBLIC SERVICE OF COLORADO
    A-E FIRM                                     STEARNS-ROGER
    DEVELOPMENT LEVEL                            EXPERIMENTAL
    NEW/RETROFIT                                 RETROFIT
    UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %     95.00
    UNIT DESIGN SO2 REMOVAL EFFICIENCY - %          85.00
    CURRENT STATUS                               8
    TERMINATION                                  **/75
    INITIAL START-UP                             10/74

 ** DESIGN AND OPERATING PARAMETERS

 ** ABSORBER
    NUMBER                                       1
    NUMBER OF SPARES                             0
    GENERIC TYPE                                 PACKED TOWER
    SPECIFIC TYPE                                MOBILE BED PACKING
    TRADE NAME/COMMON TYPE                       TURBULENT CONTACT ABSORBER
    SUPPLIER                                     AIR CORRECTION DIVISION, UOP
    SHELL GENERIC MATERIAL                       CARBON STEEL
    SHELL SPECIFIC MATERIAL                      AISI 1110
    SHELL MATERIAL TRADE NAME/COMMON TYPE        N/A
    LINER GENERIC MATERIAL                       ORGANIC
    LINER SPECIFIC MATERIAL                      SYNTHETIC RUBBER
    LINER MATERIAL TRADE NAME/COMMON TYPE        NEOPRENE
    SO2 REMOVAL EFFICIENCY - %                      77.5

 ** MIST ELIMINATOR
    PRE-MIST ELIMINATOR/MIST ELIMINATOR          MIST ELIMINATOR
    GENERIC TYPE                                 IMPINGEMENT
    SPECIFIC TYPE                                BAFFLE
    TRADE NAME/COMMON TYPE                       CHEVRON VANE
    CONFIGURATION                                HORIZONTAL
    NUMBER OF STAGES                                2
    NUMBER OF PASSES PER STAGE                      7
    PRESSURE DROP - KPA                            .1         (   .5 IN-H2O)
    CONSTRUCTION MATERIAL GENERIC TYPE           STAINLESS STEEL
    WASH WATER SOURCE                            SUPERNATANT

 ** REHEATER
    NUMBER                                       1
    GENERIC TYPE                                 IN-LINE
    SPECIFIC TYPE                                STEAM
    TEMPERATURE INCREASE - C                        18.3          (   65 F)

 ** FANS
    FUNCTION                                     BOOSTER
    APPLICATION                                  FORCED DRAFT
    SERVICE                                      DRY
    CONSTRUCTION MATERIAL GENERIC TYPE           CARBON STEEL

 ** DUCTWORK
    LOCATION                                     OUTLET
     SHELL GENERIC MATERIAL TYPE                 CARBON STEEL
     LINER GENERIC MATERIAL TYPE                 NONE
```

PUBLIC SERVICE OF COLORADO: VALMONT 5A (CONT.)

** TANKS

SERVICE	NUMBER
RECYCLE WATER	1

*** SLUDGE

** DISPOSAL

NATURE	FINAL
TYPE	POND

** WATER BALANCE

WATER LOOP TYPE	CLOSED	
EVAPORATION WATER LOSS - LITER/S	5.5	(88 GPM)

---------PERFORMANCE DATA---------

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/74	SYSTEM										

** PROBLEMS/SOLUTIONS/COMMENTS

REFER TO PERFORMANCE UPDATE INFORMATION FOR VALMONT 5 LOCATED IN SECTION 14 OF THIS REPORT.

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

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COMPANY NAME                                    SOUTHERN CALIFORNIA EDISON
PLANT NAME                                      MOHAVE
UNIT NUMBER                                     1A
CITY                                            LAUGHLIN
STATE                                           NEVADA
REGULATORY CLASSIFICATION                       B
PARTICULATE EMISSION LIMITATION - NG/J             28.         (  .064 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                     64.         (  .150 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                  ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                1580
GROSS UNIT GENERATING CAPACITY - MW                790
NET UNIT GENERATING CAPACITY W/FGD - MW            790
NET UNIT GENERATING CAPACITY WO/FGD - MW           790
EQUIVALENT SCRUBBED CAPACITY - MW                  170

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                            COMBUSTION ENGINEERING
     BOILER TYPE                                PULVERIZED COAL
     BOILER SERVICE LOAD                        BASE
     DESIGN BOILER FLUE GAS FLOW - CU.M/S       ********       (******* ACFM)
     BOILER FLUE GAS TEMPERATURE - C              132.2        ( 270 F)
     STACK HEIGHT - M                             152.         ( 500 FT)
     STACK SHELL                                ******
     STACK TOP DIAMETER - M                     *******        (***** FT)

 ** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 ******
     AVERAGE HEAT CONTENT - J/G                 26749.         ( 11500 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                11000-12000
     AVERAGE ASH CONTENT - %                       10.00
     RANGE ASH CONTENT - %                      ******
     AVERAGE MOISTURE CONTENT - %               ********
     RANGE MOISTURE CONTENT - %                 ******
     AVERAGE SULFUR CONTENT - %                      .40
     RANGE SULFUR CONTENT - %                   ******
     AVERAGE CHLORIDE CONTENT - %               ********
     RANGE CHLORIDE CONTENT - %                 ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
     NUMBER                                       0
     TYPE                                       NONE

 ** FABRIC FILTER
     NUMBER                                       0
     TYPE                                       NONE

 ** ESP
     NUMBER                                       1
     SUPPLIER                                   RESEARCH-COTTRELL
     PARTICLE REMOVAL EFFICENCY - %                97.2

 ** PARTICLE SCRUBBER
     GENERIC TYPE                               NONE
     SPECIFIC TYPE                              N/A

*** FGD SYSTEM

 ** GENERAL DATA
     SALEABLE PRODUCT/THROWAWAY PRODUCT         THROWAWAY PRODUCT
     SO2 REMOVAL MODE                           WET SCRUBBING
     PROCESS TYPE                               LIMESTONE
     SYSTEM SUPPLIER                            AIR CORRECTION DIVISION, UOP
     DEVELOPMENT LEVEL                          PROTOTYPE
     NEW/RETROFIT                               RETROFIT
     UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %  97.20
     CURRENT STATUS                               8
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SOUTHERN CALIFORNIA EDISON: MOHAVE 1A (CONT.)

     TERMINATION                                **/75
     COMMERCIAL START-UP                         1/74

 ** DESIGN AND OPERATING PARAMETERS

 ** ABSORBER
     NUMBER                                      1
     GENERIC TYPE                               PACKED TOWER
     SUPPLIER                                   AIR CORRECTION DIVISION, UOP
     DIMENSIONS - FT                            18 X 40 X 90
     SHELL GENERIC MATERIAL                     CARBON STEEL
     SHELL SPECIFIC MATERIAL                    AISI 1110
     SHELL MATERIAL TRADE NAME/COMMON TYPE      N/A
     LINER GENERIC MATERIAL                     ORGANIC
     LINER MATERIAL TRADE NAME/COMMON TYPE      RUBBER
     GAS CONTACTING DEVICE TYPE                 'PING PONG BALLS'
     NUMBER OF CONTACTING ZONES                  4
     L/G RATIO - L/CU.M                            11.1        ( 83.0 GAL/1000 ACF)
     SUPERFICAL GAS VELOCITY - M/SEC                3.8        ( 12.6 FT/S)
     INLET GAS FLOW - CU. M/S                     212.35       ( 450000 ACFM)
     SO2 REMOVAL EFFICIENCY - %                    95.0
     PARTICLE REMOVAL EFFICENCY - %                93.0

 ** MIST ELIMINATOR
     PRE-MIST ELIMINATOR/MIST ELIMINATOR        MIST ELIMINATOR

 ** REHEATER
     NUMBER                                      1
     GENERIC TYPE                               IN-LINE
     SPECIFIC TYPE                              STEAM
     TEMPERATURE INCREASE - C                      12.8        (   55 F)
     INLET FLUE GAS TEMPERATURE - C                51.7        (  125 F)

 ** FANS
     NUMBER                                      1
     APPLICATION                                BOOSTER

 ** REAGENT PREPARATION EQUIPMENT
     NUMBER                                      1

 ** SOLIDS CONCENTRATING/DEWATERING
     DEVICE                                     CENTRIFUGE

 ** SOLIDS CONCENTRATING/DEWATERING
     DEVICE                                     THICKENER

 ** SOLIDS CONCENTRATING/DEWATERING
     DEVICE                                     VACUUM FILTER

*** SLUDGE

 ** TREATMENT
     METHOD                                     POZ-O-TEC
     PROPRIETARY PROCESS                        IUCS

 ** DISPOSAL
     LOCATION                                   ON-SITE
     SITE TRANSPORTATION METHOD                 TRUCKED


------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS  HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

10/74  SYSTEM                                                               744
```

```
-------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
```

** PROBLEMS/SOLUTIONS/COMMENTS

TWO PROTOTYPE SULFUR DIOXIDE ABSORBER MODULES WERE INSTALLED IN 1973 AT THE MOHAVE GENERATING STATION. THE VERTICAL MODULE, A UNIVERSAL OIL PRODUCTS TURBULENT CONTACT ABSORBER (TCA) WAS TESTED IN TWO MODES; FIRST AS A TCA UNIT, FROM NOVEMBER 2, 1974 TO APRIL 30, 1975, AND SECOND AS A POLY-GRID PACKED ABSORBER (PPA), WHEN THE "PING PONG BALLS" WERE REPLACED WITH A PLASTIC "EGGCRATE" PACKING WITH TESTING CONTINUOUS TO JULY 2, 1975.

STARTUP OF THE MOHAVE 1A EXPERIMENTAL SYSTEM COMMENCED ON OCTOBER 31, 1974 AND OPERATED WITH AN AVAILABILITY OF 72% THROUGH EIGHT MONTHS OF TESTING.

THROUGH THE EIGHT MONTHS OF OPERATION, THE SYSTEM WAS OUT OF SERVICE APPROXIMATELY 1585 HOURS. THE OUTAGE TIME WAS CAUSED BY NECESSARY REPAIRS TO THE GRIDS, NOZZLES, TRAP-OUT TRAY AND TO REPAIR/REALIGN PPA PACKING. ADDITIONAL OUTAGE TIME WAS NECESSARY TO REDISTRIBUTE THE TCA BALLS, CLEAN SCALE FROM THE SCRUBBER INTERNALS, CORRECT BOOSTER FAN TRIP PROBLEMS, CONDUCT INSPECTIONS FOR EXTENDED OPERATIONS AND REMOVE A HARDHAT FROM THE THICKENER.

SYSTEM OPERATIONS WERE TERMINATED ON JULY 2, 1975. UP TO THIS TIME, THE SYSTEM LOGGED 4228 HOURS OF OPERATION.

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

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COMPANY NAME                                   SOUTHERN CALIFORNIA EDISON
PLANT NAME                                     MOHAVE
UNIT NUMBER                                    2A
CITY                                           LAUGHLIN
STATE                                          NEVADA
REGULATORY CLASSIFICATION                      B
PARTICULATE EMISSION LIMITATION - NG/J           28.        (  .064 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                   64.        (  .150 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                 ******       (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              1580
GROSS UNIT GENERATING CAPACITY - MW              790
NET UNIT GENERATING CAPACITY W/FGD - MW          790
NET UNIT GENERATING CAPACITY WO/FGD - MW         790
EQUIVALENT SCRUBBED CAPACITY - MW                160

 ** UNIT DATA - BOILER AND STACK
    BOILER SUPPLIER                            COMBUSTION ENGINEERING
    BOILER TYPE                                PULVERIZED COAL
    BOILER SERVICE LOAD                        BASE
    DESIGN BOILER FLUE GAS FLOW - CU.M/S       ********     (******* ACFM)
    BOILER FLUE GAS TEMPERATURE - C              132.2      ( 270 F)
    STACK HEIGHT - M                             152.       ( 500 FT)
    STACK SHELL                                ******
    STACK TOP DIAMETER - M                     *******      (***** FT)

 ** FUEL DATA
    FUEL TYPE                                  COAL
    FUEL GRADE                                 ******
    AVERAGE HEAT CONTENT - J/G                 26749.       ( 11500 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                              11000-12000
    AVERAGE ASH CONTENT - %                       10.00
    RANGE ASH CONTENT - %                      ******
    AVERAGE MOISTURE CONTENT - %               ********
    RANGE MOISTURE CONTENT - %                 ******
    AVERAGE SULFUR CONTENT - %                      .40
    RANGE SULFUR CONTENT - %                   ******
    AVERAGE CHLORIDE CONTENT - %               ********
    RANGE CHLORIDE CONTENT - %                 ******

*** PARTICLE CONTROL

 ** MECHANICAL COLLECTOR
    NUMBER                                      0
    TYPE                                       NONE

 ** FABRIC FILTER
    NUMBER                                      0
    TYPE                                       NONE

 ** ESP
    NUMBER                                      1
    SUPPLIER                                   RESEARCH-COTTRELL
    PARTICLE REMOVAL EFFICENCY - %                97.2

 ** PARTICLE SCRUBBER
    GENERIC TYPE                               NONE
    SPECIFIC TYPE                              N/A

*** FGD SYSTEM

 ** GENERAL DATA
    SALEABLE PRODUCT/THROWAWAY PRODUCT         THROWAWAY PRODUCT
    SO2 REMOVAL MODE                           WET SCRUBBING
    PROCESS TYPE                               LIME
    SYSTEM SUPPLIER                            SO. CALIFORNIA EDISON/STEARNS-
    A-E FIRM                                   STEARNS-ROGER
    DEVELOPMENT LEVEL                          PROTOTYPE
    NEW/RETROFIT                               RETROFIT
    UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %   97.20
```

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SOUTHERN CALIFORNIA EDISON: MOHAVE 2A (CONT.)

    CURRENT STATUS                              8
    TERMINATION                                 **/75
    COMMERCIAL START-UP                         11/73

** DESIGN AND OPERATING PARAMETERS

** ABSORBER
    NUMBER                                      1
    GENERIC TYPE                                SPRAY TOWER
    SPECIFIC TYPE                               OPEN CROSSCURRENT SPRAY
    TRADE NAME/COMMON TYPE                      WEIR HORIZONTAL SPRAY CHAMBER
    SUPPLIER                                    SCE/STEARNS-ROGER
    DIMENSIONS - FT                             15 X 30 X 60
    SHELL GENERIC MATERIAL                      CARBON STEEL
    SHELL SPECIFIC MATERIAL                     AISI 1110
    SHELL MATERIAL TRADE NAME/COMMON TYPE       N/A
    NUMBER OF CONTACTING ZONES                  4
    L/G RATIO - L/CU.M                             4.0       ( 30.0 GAL/1000 ACF)
    SUPERFICAL GAS VELOCITY - M/SEC                6.6       ( 21.6 FT/S)
    INLET GAS FLOW - CU. M/S                     212.35      ( 450000 ACFM)
    SO2 REMOVAL EFFICIENCY - %                    95.0
    PARTICLE REMOVAL EFFICENCY - %                93.0

** MIST ELIMINATOR
    PRE-MIST ELIMINATOR/MIST ELIMINATOR         MIST ELIMINATOR
    CONFIGURATION                               VERTICAL
    NUMBER OF STAGES                               1

** REHEATER
    NUMBER                                      1
    GENERIC TYPE                                INDIRECT HOT AIR
    SPECIFIC TYPE                               EXTERNAL HEAT EXCHANGER
    TRADE NAME/COMMON TYPE                      STEAM TUBE BUNDLES
    TEMPERATURE INCREASE - C                      12.8       (   55 F)
    INLET FLUE GAS TEMPERATURE - C                48.9       (  120 F)

** FANS
    NUMBER                                      1
    APPLICATION                                 BOOSTER

*** SLUDGE

** TREATMENT
    METHOD                                      CALCILOX
    PROPRIETARY PROCESS                         DRAVO

** DISPOSAL
    TYPE                                        LINED POND

** WATER BALANCE
    WATER LOOP TYPE                             CLOSED


-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

11/73  SYSTEM

         ** PROBLEMS/SOLUTIONS/COMMENTS

                               TWO PROTOTYPE SULFUR DIOXIDE ABSORBER MODULES WERE INSTALLED IN 1973 AT THE
                               MOHAVE GENERATING STATION.  A FOUR-STAGE HORIZONTAL CROSSFLOW SPRAY
                               SCRUBBER WAS INSTALLED ON UNIT 2.

                               IN NOVEMBER 1973 THE UTILITY OPERATED THE FGD SYSTEM AT MOHAVE 2A IN A
                               SHORT SERIES OF STARTUP TESTS THAT ENDED ON JANUARY 16, 1974 WHEN A FORMAL
```

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR

TEST PROGRAM WAS INITIATED TO ACCESS PERFORMANCE AND RELIABILITY CHARACTERISTICS OF THE SCRUBBING SYSTEM.

DURING THE 13 MONTHS OF EXPERIMENTAL OPERATION THE SYSTEM EXPERIENCED A NUMBER OF PROBLEMS WHICH ACCOUNTED FOR APPROXIMATELY 1757 HOURS OF OUTAGE TIME. THESE OUTAGES WERE CAUSED BY PUMP REPAIRS, HOPPER LEAKS, BOOSTER FAN BALANCE PROBLEMS, MODIFICATIONS AND REPAIR OF THE PLASTIC MIST ELIMINATOR BLADES, SPRAY NOZZLE REPLACEMENT, GAS INLET FLOW DISTRIBUTION MODIFICATIONS, SLAKING WATER MODIFICATIONS FOR SCALE PREVENTION, AN INSPECTION FOR EXTENDED OPERATIONS AND REMOVAL OF A HARDHAT FROM THE THICKENER.

THE TEST PROGRAM WAS TERMINATED ON FEBRUARY 9, 1975 FOLLOWING 5927 HOURS OF OPERATION. THE MODULE WAS SUBSEQUENTLY DISMANTLED, TRANSPORTED, AND REASSEMBLED AT THE FOUR CORNERS PLANT OF ARIZONA PUBLIC SERVICE WHERE ADDITIONAL TESTING WAS CONDUCTED AND COMPLETED (DECEMBER 1976).

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

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COMPANY NAME                                    TENNESSEE VALLEY AUTHORITY
PLANT NAME                                      SHAWNEE
UNIT NUMBER                                     10C
CITY                                            PADUCAH
STATE                                           KENTUCKY
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J            43.          (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                   516.          ( 1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                  ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW               1750
GROSS UNIT GENERATING CAPACITY - MW                10
NET UNIT GENERATING CAPACITY W/FGD - MW         *****
NET UNIT GENERATING CAPACITY WO/FGD - MW        *****
EQUIVALENT SCRUBBED CAPACITY - MW                  10

 ** UNIT DATA - BOILER AND STACK
    BOILER SUPPLIER                             BABCOCK & WILCOX
    BOILER TYPE                                 PULVERIZED COAL
    BOILER SERVICE LOAD                         BASE
    DESIGN BOILER FLUE GAS FLOW - CU.M/S        ********       (******* ACFM)
    BOILER FLUE GAS TEMPERATURE - C             *******        (**** F)
    STACK HEIGHT - M                             244.          ( 800 FT)
    STACK SHELL                                 ******
    STACK TOP DIAMETER - M                      *******        (***** FT)

 ** FUEL DATA
    FUEL TYPE                                   COAL
    FUEL GRADE                                  BITUMINOUS
    AVERAGE HEAT CONTENT - J/G                  ******         (****** BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                 ******
    AVERAGE ASH CONTENT - %                     ********
    RANGE ASH CONTENT - %                       ******
    AVERAGE MOISTURE CONTENT - %                ********
    RANGE MOISTURE CONTENT - %                  ******
    AVERAGE SULFUR CONTENT - %                     2.90
    RANGE SULFUR CONTENT - %                    ******
    AVERAGE CHLORIDE CONTENT - %                ********
    RANGE CHLORIDE CONTENT - %                  ******

*** PARTICLE CONTROL

 ** PARTICLE SCRUBBER
    GENERIC TYPE                                PACKED TOWER
    SPECIFIC TYPE                               MOBILE BED PACKING

*** FGD SYSTEM

 ** GENERAL DATA
    SALEABLE PRODUCT/THROWAWAY PRODUCT          THROWAWAY PRODUCT
    SO2 REMOVAL MODE                            WET SCRUBBING
    PROCESS TYPE                                LIME/LIMESTONE
    SYSTEM SUPPLIER                             COMBUSTION ENGINEERING
    A-E FIRM                                    BECHTEL
    DEVELOPMENT LEVEL                           PROTOTYPE
    NEW/RETROFIT                                RETROFIT
    CURRENT STATUS                              8
    TERMINATION                                 **/73
    INITIAL START-UP                             4/72

 ** DESIGN AND OPERATING PARAMETERS

 ** ABSORBER
    GENERIC TYPE                                PACKED TOWER
    SPECIFIC TYPE                               STATIC BED PACKING
    TRADE NAME/COMMON TYPE                      MARBLE-BED SCRUBBER
    GAS CONTACTING DEVICE TYPE                  3/4 IN. GLASS SPHERES
    INLET GAS FLOW - CU. M/S                       14.16       (   30000 ACFM)
```

TENNESSEE VALLEY AUTHORITY: SHAWNEE 10C (CONT.)

** REHEATER	
GENERIC TYPE	DIRECT COMBUSTION
TRADE NAME/COMMON TYPE	OIL
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
*** SLUDGE	
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/72	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

IN JUNE 1968, THE EPA INITIATED A PROGRAM TO TEST PROTOTYPE WET LIME AND LIMESTONE SCRUBBING SYSTEMS FOR REMOVAL OF SULFUR DIOXIDE AND PARTICLE MATTER FROM FLUE GAS. THREE PARALLEL WET SCRUBBER SYSTEMS WERE SELECTED FOR THE TEST PROJECT: 1) A VENTURI WITH A SPRAY TOWER AFTER THE ABSORBER; 2) A TURBULENT CONTACT ABSORBER (TCA); AND 3) A MARBLE-BED ABSORBER.
THE MARBLE-BED ABSORBER TESTED ON SHAWNEE 10C USED A PACKING OF 3/4 INCH GLASS MARBLE SPHERES AND A TURBULENT LAYER OF LIQUID AND GAS ABOVE THE MARBLE LAYER TO ENHANCE MASS TRANSFER.
THE TEST FACILITY WAS DESIGNED SO THAT MODIFICATIONS AND VARIATIONS OF SCRUBBER INTERNALS AND PIPING COULD BE READILY EMPLOYED FOR EACH SCRUBBER SYSTEM.

THE MARBLE BED ABSORBER AT SHAWNEE 10C COMMENCED OPERATIONS IN APRIL 1972.

THIS MARBLE-BED ABSORBER WAS DISCONTINUED EARLY IN THE TEST PROGRAM, JULY 1973, BECAUSE OF CONTINUED OPERATING PROBLEMS WITH NOZZLE FAILURE AND SUBSEQUENT PLUGGING OF THE MARBLE-BED.

SECTION 16
DESIGN AND PERFORMANCE DATA FOR DISCONTINUED DOMESTIC FGD SYSTEMS

```
COMPANY NAME                                    UNION ELECTRIC
PLANT NAME                                      MEREMAC
UNIT NUMBER                                     2
CITY                                            ******
STATE                                           MISSOURI
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J          ******         (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  ******         (****** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J                  ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW               4135
GROSS UNIT GENERATING CAPACITY - MW               140
NET UNIT GENERATING CAPACITY W/FGD - MW           125
NET UNIT GENERATING CAPACITY WO/FGD - MW        *****
EQUIVALENT SCRUBBED CAPACITY - MW                 140

 ** UNIT DATA - BOILER AND STACK
     BOILER SUPPLIER                            ******
     BOILER TYPE                                PULVERIZED COAL
     BOILER SERVICE LOAD                        BASE
     DESIGN BOILER FLUE GAS FLOW - CU.M/S       ********       (******* ACFM)
     BOILER FLUE GAS TEMPERATURE - C            *******        (**** F)
     STACK HEIGHT - M                           ******         (**** FT)
     STACK SHELL                                ******
     STACK TOP DIAMETER - M                     *******        (***** FT)

 ** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 ******
     AVERAGE HEAT CONTENT - J/G                 ******         (****** BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                ******
     AVERAGE ASH CONTENT - %                    ********
     RANGE ASH CONTENT - %                      ******
     AVERAGE MOISTURE CONTENT - %               ********
     RANGE MOISTURE CONTENT - %                 ******
     AVERAGE SULFUR CONTENT - %                     3.40
     RANGE SULFUR CONTENT - %                   ******
     AVERAGE CHLORIDE CONTENT - %               ********
     RANGE CHLORIDE CONTENT - %                 ******

*** PARTICLE CONTROL

 ** PARTICLE SCRUBBER
     GENERIC TYPE                               PACKED TOWER
     SPECIFIC TYPE                              STATIC BED PACKING

*** FGD SYSTEM

 ** GENERAL DATA
     SALEABLE PRODUCT/THROWAWAY PRODUCT         THROWAWAY PRODUCT
     SO2 REMOVAL MODE                           WET SCRUBBING
     PROCESS TYPE                               LIMESTONE
     SYSTEM SUPPLIER                            COMBUSTION ENGINEERING
     DEVELOPMENT LEVEL                          FULL SCALE
     NEW/RETROFIT                               RETROFIT
     UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %   99.00
     UNIT DESIGN SO2 REMOVAL EFFICIENCY - %        83.00
     CURRENT STATUS                              8
     TERMINATION                                **/69
     INITIAL START-UP                            3/68

 ** DESIGN AND OPERATING PARAMETERS

 ** ABSORBER
     GENERIC TYPE                               PACKED TOWER

 ** WATER BALANCE
     WATER LOOP TYPE                            CLOSED
```

UNION ELECTRIC: MEREMAC 2 (CONT.)

PERFORMANCE DATA											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/68	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST COMMERCIAL SCRUBBER APPLICATION ON A UTILITY COAL-FIRED BOILER OCCURRED AT THIS STATION IN EARLY 1968.

THE PROBLEMS ENCOUNTERED DURING OPERATION OF THIS SYSTEM INCLUDED BOILER TUBE FOULING BECAUSE OF THE CLOSE TUBE SPACING, WIDESPREAD SCALING, SEVERE CORROSION, INEFFICIENT MIST ELIMINATOR AND PROBLEMS WITH WASTE DISPOSAL.

THE SCRUBBING PROGRAM WAS EVENTUALLY TERMINATED AND THE INSTALLATION WAS ABANDONED.

APPENDIX A

FGD SYSTEM COST DATA: OPERATIONAL AND NONOPERATIONAL SYSTEMS

INTRODUCTION

The cost of flue gas desulfurization (FGD) systems is an area of intense interest and substantial controversy and few realistic cost figures have been established. Many cost figures (both capital and annual) are largely site-sensitive values. Such figures cannot be compared from one system to another because they refer to different FGD battery limits and different years in which the expenditures were made. This cost analysis was undertaken because of these concerns and the lack of comparable cost data.

Analysis is made only for operating FGD systems in this study because they potentially have complete and accurate economic data. Adjustments are made to provide comparable, accurate cost data for the sulfur dioxide portion of the emission control system. This, in effect, eliminates much of the confusion that exists concerning the reported data, and it provides a common basis for the reported costs.

The reported figures are acquired from various sources. The most reliable information was obtained from a previous cost study initiated by PEDCo Environmental in March 1978. In this first study each utility having at least one operational FGD system at the time was given a cost form containing all available cost information then in the PEDCo files. The utility was asked to verify the data and fill in any missing information. The PEDCo Environmental staff made a follow-up visit to complete and verify the data collected. Results of the cost analysis were then forwarded to each participating utility for final review and comment.

For this cost analysis, the primary source of reported cost information was the 1978 DOE Form 67. Utilities are generally required to complete this form, which includes capital and annual costs, once per year for operating stations. The 1978 forms were the most recent forms available. Although the information included in the DOE Form 67 is not as specific and is formatted differently than the PEDCo forms, the figures were fitted as well as possible.

Some costs were also taken from FGD cost survey questionnaires developed by Edison Electric Institute. The EEI forms contain useful capital cost information, however, in some cases the costs were projections rather than actual dollar expenditures.

In addition to the sources just mentioned, some 1978 and 1979 annual costs were made available by a few utilities via written transmittals and telephone communications.

It is assumed that the figures collected from all these sources provided a firm base to make adjustments. In general, it was possible to determine the scope of the reported costs so that estimates could be made for missing costs, and non-FGD-related costs could be deleted. In cases where this was not possible, assumptions were made as to what items were and what were not included in the total figures, and the adjustments were based on these assumptions.

The adjustment procedure is summarized below:

CAPITAL COSTS

- All costs associated with control of particulate matter emissions are deducted.
- Capital costs for modifications necessitated by installation of an FGD system are added if they were not included in the reported costs.
- Sludge disposal costs are adjusted to reflect a 20-year life span for retrofit FGD systems and a 30-year life span for new FGD systems.
- Any unreported direct and indirect costs incurred are estimated and included.
- All capital costs are escalated to 1980 dollars.
- All $/kW values reflect the gross generating capacity of the unit.

ANNUAL COSTS

- All non-labor costs are adjusted to a common 65 percent capacity factor.
- Direct costs that were not reported are estimated and added.
- Overhead and fixed costs that were not reported are estimated and added.
- All annual costs are escalated to 1980 dollars.
- The final mills/kWh figure for each cost study is based on a standard 65 percent capacity factor and the net generating capacity of the unit.

A more complete description of the cost adjustment procedure may be found in the section titled Cost Adjustment Procedure and Background of this Appendix (Page A-9). The results of the cost analysis are listed in the section that follows. Section A-1 summarizes the reported and adjusted capital and annual costs for all the operational FGD systems that were addressed in the cost study. Also included in this section are the standardized adjusted annual costs (see Page A-18). Section A-2 summarizes available cost data for nonoperational FGD systems.

RESULTS OF THE COST ANALYSIS

The results of the operational FGD system survey are summarized in Tables A-1 and A-2. Table A-1 summarizes the reported and adjusted capital and annual costs for all the operational FGD systems addressed in the survey. Table A-2 provides a summary of a categorical analysis of the reported and adjusted capital and annual costs for the operational FGD systems addressed in the survey. Included in this categorical analysis are the ranges, means, and standard deviation for all the various types and categories of FGD systems examined.

TABLE A-1. REPORTED AND ADJUSTED CAPITAL AND ANNUAL COSTS FOR OPERATIONAL FGD SYSTEMS

	Reported				Adjusted			
	Capital	$/kw	Annual	Mills/kWh	Capital	$/kw	Annual	Mills/kWh
Alabama Electric								
Tombigbee 2	6,992,100	27.4	434,929	0.33	8,949,750	35.1	3,896,950	2.91
Tombigbee 3	6,992,100	27.4	434,929	0.33	8,949,750	35.1	3,896,950	2.91
Arizona Electric Power								
Apache 2	8,143,069	41.8	51,784	0.05	12,081,900	62.0	3,431,400	3.44
Apache 3	7,214,052	37.0	51,784	0.05	11,380,300	58.4	3,431,400	3.44
Arizona Public Service								
Cholla 1	6,550,000	52.0	NA	NA	9,400,200	74.6	3,038,800	4.23
Cholla 2	44,352,000	168.0	1,003,564	0.75	39,248,800	146.7	10,099,300	7.55
Central Illinois Light								
Duck Creek 1	31,125,000	78.4	10,851,000	5.04	58,416,200	140.4	17,143,200	7.98
Central Illinois Public Service								
Newton 1	107,831,000	174.8	NA	NA	149,288,600	242.1	42,020,300	12.83
Columbus & Southern Ohio Electric								
Conesville 5	20,863,500	50.3	8,670,530	5.52	37,473,700	91.2	13,357,600	6.26
Conesville 6	20,863,500	50.3	8,670,530	5.52	37,473,700	91.2	13,357,600	6.26
Duquesne Light								
Elrama 1-4	61,320,000	120.2	21,027,451	7.18	37,849,400	172.3	32,916,500	11.67
Phillips 1-6	52,055,000	127.0	18,301,000	11.32	78,991,900	192.7	31,025,700	16.27
Indianapolis Power & Light								
Petersburg 3	55,820,000	104.9	NA	NA	79,103,100	148.7	26,275,600	8.96
Kansas City Power & Light								
Hawthorn 3	3,220,000	29.4	346,441	1.15	6,329,650	57.5	2,612,450	4.71
Hawthorn 4	3,220,000	29.4	346,441	1.15	6,329,650	57.5	2,612,450	4.71
LaCygne 1	46,900,000	53.7	8,060,047	5.38	80,279,100	91.9	48,739,200	10.44
Kansas Power & Light								
Jeffrey 1	27,306,900	37.9	321,000	0.11	36,178,300	50.2	8,528,400	2.20
Kentucky Utilities								
Green River 1-3	3,986,155	62.0	364,005	5.20	6,916,800	100.1	3,467,900	10.15
Louisville Gas & Electric								
Cane Run 4	12,647,000	66.6	960,301	1.29	20,073,800	105.7	5,448,000	5.28
Cane Run 5	13,759,000	68.8	763,443	0.92	18,703,000	93.9	5,314,600	4.07
Cane Run 6	20,596,900	71.5	NA	NA	23,204,500	80.6	9,133,500	5.96
Mill Creek 3	18,846,000	42.6	321,463	1.25	26,751,200	60.5	8,855,500	3.70
Paddy's Run 6	4,320,300	61.7	NA	NA	8,540,200	122.0	4,079,300	11.28
Minnesota Power Cooperative								
Milton R. Young 2	44,119,600	100.3	754,445	0.53	62,872,700	142.9	13,783,100	5.75
Monongahela Power								
Pleasants 1	65,693,100	106.3	9,015,379	2.73	70,058,000	113.4	26,143,300	7.92
Montana Power								
Colstrip 1	38,500,000	101.4	6,128,000	2.97	48,183,200	133.8	14,396,500	7.62
Colstrip 2	38,500,000	101.4	6,128,000	2.97	48,183,200	133.8	14,396,500	7.62
Nevada Power								
Reid Gardner 1	5,363,375	42.9	251,514	0.46	9,993,000	79.9	3,314,750	5.29
Reid Gardner 2	5,363,375	42.9	251,514	0.46	9,993,000	79.9	3,314,750	5.29
Reid Gardner 3	12,599,160	100.8	131,824	0.23	17,307,000	138.5	4,247,300	6.78
Northern Indiana Public Service								
Dean H. Mitchell 11	18,192,040	157.4	2,414,599	13.02	26,999,900	233.6	9,991,300	18.67
Northern States Power								
Sherburne 1	34,982,020	49.3	2,716,759	0.75	67,996,050	96.4	19,330,820	4.99
Sherburne 2	34,982,020	49.3	2,716,759	0.75	67,996,050	96.4	19,330,820	4.99
Pacific Power & Light								
Jim Bridger 4	49,643,000	90.3	NA	NA	59,732,500	108.6	17,854,100	6.71
Pennsylvania Power								
Bruce Mansfield 1	110,639,000	120.7	9,979,900	3.28	121,306,350	132.3	50,794,500	10.81
Bruce Mansfield 2	110,639,000	120.7	9,979,900	3.28	121,306,350	132.3	50,794,500	10.81
Public Service Company of New Mexico								
San Juan 1	47,944,400	132.8	NA	NA	92,034,200	254.9	27,227,100	15.23
San Juan 2	47,985,000	137.1	NA	NA	90,608,100	258.9	26,852,900	15.41
South Carolina Public Service Authority								
Winyah 2	6,646,098	23.7	527,000	0.29	12,060,100	43.1	2,476,200	1.69
South Mississippi Electric								
R.D. Morrow 1	10,896,000	53.7	NA	NA	22,056,750	108.7	6,513,850	6.36
R.D. Morrow 2	10,896,000	53.7	NA	NA	22,056,750	108.7	6,513,850	6.36
Southern Illinois Power Coop								
Marion 4	15,200,930	87.9	859,453	0.98	19,177,500	110.9	6,525,500	2.12
Southern Indiana Gas & Electric								
A.B. Brown 1	12,495,000	47.2	1,850,565	1.30	21,477,900	81.0	6,534,600	4.59
Springfield City Utilities								
Southwest 1	16,744,500	86.3	778,749	1.20	25,904,900	133.5	7,490,000	7.60
Tennessee Valley Authroity								
Widows Creek 8	47,900,000	87.1	14,576,400	7.76	79,785,300	145.1	19,572,000	6.66
Utah Power & Light								
Hunter 1	24,400,000	56.7	NA	NA	29,625,000	68.9	9,740,100	4.28
Huntington 1	27,090,000	63.0	2,946,400	1.27	35,498,200	82.6	12,317,200	5.41

NA - Annual costs not available from the utility.

TABLE A-2. CATEGORICAL RESULTS OF THE REPORTED AND ADJUSTED CAPITAL AND ANNUAL COSTS FOR OPERATIONAL FGD SYSTEMS

	Reported						Adjusted					
	Capital			Annual			Capital			Annual		
	Range, $/kW	Average, $/kW	σ	Range, mills/kWh	Average, mills/kWh	σ	Range, $/kW	Average, $/kW	σ	Range, mills/kWh	Average, mills/kWh	σ
All	23.7-243.0	79.1	45.4	0.05-13.02	2.64	3.14	35.1-258.9	113.5	54.6	1.69-18.67	7.27	3.82
New	23.7-243.0	77.5	47.2	0.05-5.52	1.84	1.84	35.1-242.1	103.8	43.3	1.69-12.83	6.31	2.68
Retrofit	29.4-157.4	83.2	41.4	0.46-13.02	4.54	4.64	57.5-258.9	132.3	69.4	4.23-18.67	9.12	4.99
Saleable	132.8-185.0	153.0	23.8	13.02-13.02	13.02	0.0	233.6-258.9	249.1	13.6	15.23-18.67	16.44	1.94
Throwaway	23.7-243.0	73.7	41.8	0.05-11.32	2.35	2.65	35.1-242.1	104.2	42.5	1.69-16.27	6.64	3.03
Alkaline flyash/lime	100.3-101.4	101.0	0.6	0.53-2.97	2.16	1.41	133.8-142.9	136.8	5.2	5.75-7.62	6.99	1.08
Alkaline flyash/limestone	49.3-49.3	49.3	0.0	0.75-0.75	0.75	0.0	94.4-94.4	94.4	0.0	4.99-4.99	4.99	0.0
Dual alkali	47.2-174.8	97.8	67.7	1.30-1.30	1.30	0.0	80.6-242.1	134.6	93.1	4.59-12.83	7.79	4.41
Lime	29.4-243.0	80.1	50.6	0.92-11.32	3.65	3.02	57.5-192.7	105.1	39.1	3.70-16.27	7.79	3.63
Limestone	23.7-168.0	65.0	34.9	0.05-7.76	1.78	2.54	35.1-148.7	93.4	42.5	1.69-10.44	5.61	2.65
Sodium carbonate	42.9-100.8	69.2	30.7	0.23-0.46	0.38	0.13	79.9-138.5	101.7	28.0	5.29-6.78	5.88	0.73
Wellman Lord	132.8-185.0	153.1	23.8	13.02-13.02	13.02	0.0	233.6-258.9	249.1	13.6	15.23-18.67	16.44	1.94

COST ADJUSTMENT PROCEDURE AND BACKGROUND

The cost data were treated solely to establish accurate costs for FGD systems, on a common basis, not to critique the design or reasonableness of the costs reported by any utility. Adjustments focus primarily on the following items:

- All capital costs are adjusted to mid-1980 dollars using the escalation factors shown in Table A-3. Actual costs were reported by utilities in dollar values for years 1970 to 1980. The total figure is broken down into dollars/year and each year total is escalated to 1980 dollars and totaled again. All capital costs, represented in dollars/kilowatt ($/kW), are expressed in terms of gross megawatts (MW).
- Gross unit capacity is used to express all FGD capital expenditures because the capital requirement of an FGD system is dependent on actual boiler size before derating for auxiliary and air quality control power requirements.
- Particulate control costs are deducted. Since the purpose of the study is to estimate the incremental cost for sulfur dioxide control, particulate control costs deducted using either data contained in the costs breakdowns or as a percentage of the total direct cost (capital and annual). The percentage reduction varies depending upon system design and operation.
- The capital costs associated with the modification or installation of equipment not part of the FGD system but needed for its proper functioning, are included (e.g., stack lining, modification to existing ductwork or fans, etc.).
- Indirect charges are adjusted to provide adequate funds for engineering, field expenses, legal expenses, insurance, interest during construction, allowance for startup, taxes, and contingency expenditures.

TABLE A-3. ESCALATION FACTORS

Year[a]	Capital investment[b]	Utilities[c]	Chemicals[d]	O&M labor[e]	Construction labor[f]
1970	0.537	0.238	0.550	0.540	0.542
1971	0.576	0.277	0.584	0.583	0.613
1972	0.600	0.321	0.603	0.630	0.669
1973	0.624	0.372	0.624	0.681	0.704
1974	0.738	0.496	0.733	0.735	0.768
1975	0.825	0.665	0.819	0.794	0.824
1976	0.875	0.762	0.866	0.857	0.887
1977	0.934	0.873	0.928	0.926	0.937
1978	1.000	1.000	1.000	1.000	1.000
1979	1.090	1.100	1.075	1.080	1.080
1980	1.188	1.210	1.156	1.166	1.166
1981	1.295	1.331	1.242	1.260	1.260
1982	1.412	1.464	1.335	1.360	1.360
1983	1.539	1.611	1.436	1.470	1.470
1984	1.677	1.772	1.543	1.587	1.587
1985	1.828	1.949	1.659	1.714	1.714

[a] Cost index is for mid year (June).

[b] Reference: Marshall and Swift.

[c] Includes fuel and electricity; reference: Department of Commerce.

[d] Reference: Bureau of Mines.

[e] Reference: Department of Labor.

[f] Reference: Engineering News Record.

- All annual costs, represented in mills/kilowatt-hour (mills/kWh), are expressed in terms of net megawatts (MW).

- Net unit capacity is used to express all FGD annual expenditures because the annual cost requirement of an FGD system is dependent on the actual number of kilowatt-hours (kWh) produced by the unit after derating for auxiliary and air quality control power requirements.

- All non-labor annual costs are adjusted to a common 65 percent capacity factor.

- Replacement power costs for retrofitted FGD systems* are not included since only a few utilities reported such costs and these were presented using a variety of methods.

- Sludge disposal costs are adjusted to reflect the costs of sulfur dioxide waste disposal only (i.e., excluding fly ash disposal except where usable as a sludge stabilizing agent) and to provide for disposal over the anticipated lifetime of the FGD system. This latter correction is necessary since several utilities reported costs for sludge disposal capacity that would last only a fraction of the FGD system life. The adjustments are based on a land cost of $2000/acre with a sludge depth of 50 ft in a clay-lined pond (clay is assumed to be available at the site).

- A 30-year life is assumed for all process and economic considerations for all new systems that were installed for the life of the unit. A 20-year life is assumed for all process and economic considerations for retrofit systems that were installed for the remaining portion of the life of the unit.**

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*If an FGD system is retrofitted to an existing boiler the new electrical power demand of the FGD equipment will decrease the boiler net MW rating. Since the boiler was originally sized and designed to accommodate a certain grid demand, the utility may be forced to buy make-up power from the grid and/or increase the design capacity of planned boilers.

**The use of a 30-year service life for new units coincides with the conclusion of the National Power Survey of the Federal Power Commission which recognized this value as reasonable for steam-electric plants. A 20-year service life was assumed for all retrofit units even if the remaining life of the units is less than this value. Thus, two different rates are used and should be noted when making comparisons between new and retrofit systems.

- Regeneration and by-product recovery facility costs are added for those regenerable systems not reporting such costs.

To the extent possible, all cost adjustments are made using the previous assumptions developed by PEDCo Environmental. When cost data are inadequate, adjustments are made using process design data in conjunction with the previous cost assumptions. In some cases, adjustments are not possible because of insufficient data.

DESCRIPTION OF COST ELEMENTS

Capital costs consist of direct costs, indirect costs, and other capital costs (including contingency). Direct costs include the "bought-out" cost of the equipment, the cost of installation, and site development. Indirect costs include interest during construction, contractor's fees and expenses, engineering, legal expenses, taxes, insurance, allowance for start-up and shakedown, and spares. Contingency costs include those costs resulting from malfunctions, equipment alterations, and similar unforeseen sources. Other capital costs include the nondepreciable items of land and working capital.

Annual costs consist of direct costs, fixed costs, and overhead costs. Direct costs include the cost of raw materials, utilities, operating labor and supervision, and maintenance and repairs. Fixed costs include those of depreciation, interim replacement, insurance, taxes, and interest on borrowed capital. Overhead costs include those of plant and payroll expenses. The various capital and annual cost components are discussed and defined in greater detail in the text that follows.

CAPITAL COSTS

Direct Capital Costs

The direct capital costs include the following elements:

° Equipment required for the FGD system. Table A-4 provides a summary of the major process equipment used in FGD systems.

° Installation of equipment, including foundations; steel work for support, buildings, piping and ducting for effluents, slurries, sludge, and make-up water, control panels, instrumentation, insulation of ducting, buildings, piping, and other equipment, painting and piling.

° Site development may include clearing and grading, construction of access roads and walkways, establishment of rail, barge, and/or truck facilities, and parking facilities.

Indirect Capital Costs

Indirect capital costs include the following elements:

° Interest accrued on borrowed capital during construction.

° Contractor's fee and expenses, including costs for field labor payroll; field office supervision; personnel; construction offices; temporary roadways; railroad trackage; maintenance and welding shops; parking lot; communications; temporary piping and electrical and sanitary facilities; safety security (fire, material, medical, etc.); construction tools and rental equipment; unloading and storage of materials; travel expenses; permits; licenses; taxes; insurance; overhead; legal liabilities; field testing of equipment; start-up; and labor relations.

° Engineering costs, including administrative, process, project, and general; design and related functions for specifications; bid analysis; special studies; cost analysis; accounting; reports; consultant fees; purchasing; procurement; travel expenses; living expenses; expediting; inspection; safety; communications; modeling; pilot plant studies (if required because of

TABLE A-4. MAJOR FGD SYSTEM EQUIPMENT SUMMARY

Category	Description
Material handling - raw materials	Equipment for the handling and transfer of raw materials includes unloading facilities, conveyors, storage areas and silos, vibrators, atmospheric emission control associated with these facilities, and related accessories
Feed preparation - raw materials	Equipment for the preparation of raw material to produce a feed slurry consists of feed weighers, crushers, grinders, classifiers, ball mills, mixing tanks, pumps, agitators, and related accessories
Sulfur dioxide absorption	Equipment for treating the flue gas includes absorbers, mist eliminators, hold tanks, agitators, circulating pumps, pond water return pumps, and related accessories
Flue gas reheat	Equipment required includes air, steam, or hot water heaters, condensate tanks, pumps, soot blowers, fans, fuel storage facilities, gas bypass equipment, and related accessories
Gas handling	Equipment to handle the boiler flue gas includes booster fans, ductwork, flue gas bypass system, turning vanes, supports, platforms, and related accessories
Sludge disposal	FGD systems that do not generate a salable product require solids/water separation equipment such as clarifiers, vacuum filters, centrifuges, sludge fixation equipment, and related accessories
Utilities	Equipment to supply power and water to the FGD equipment consists of switch-gear, breakers, transformers, piping, and related accessories
By-product handling	Equipment for processing the by-product of regenerable FGD systems may include a rotary kiln, fluid bed dryer, conveyor, storage silo, vibrator, combustion equipment and oil storage tanks, waste heat boilers, hammer mills, evaporators, crystallizers, strippers, tanks, agitators, pumps, compressors, sulfuric acid absorber and cooling, mist eliminator, pumps, acid coolers, tanks, etc.

(continued)

TABLE A-4 (continued)

Category	Description
Regeneration	Equipment for regeneration of the absorbing medium of an FGD system may consist of reactor vessels, material handling system, storage, weigh feeder, conveyor, rotary kiln, fluid bed calciner, dust collector, storage silo, vibrator, combustion equipment and oil storage tanks, waste heat boiler, hammer mill, evaporators, crystallizers, strippers, tanks, agitators, pumps, compressors, sulfuric acid absorber and cooling, mist eliminator, pumps, acid coolers, tanks, etc.
Purge treatment	Equipment for the removal of purge material (e.g., sodium sulfate) includes refrigeration, pumps, tanks, crystallizer, centrifuge, dryer, dust collector, conveyors, storage, and related equipment
Auxiliary	Equipment not directly related to the FGD system, but which may require design or modification to accommodate an FGD system may include such items as existing fans, ducts, or stack. If new fans, ducts, or stacks are added to improve boiler performance and accommodate the FGD system, the costs are prorated to the boiler and FGD system

process design or application novelty); royalty payments during construction; training of plant personnel; field engineering; safety engineering; and consultant services.

- Legal expenses, including those for securing permits, right-of-way, etc.
- Taxes, including sales, and excise taxes.
- Insurance covering liability for equipment in transit and at site; fire, casualty, injury, and death; damage to property; delay; and noncompliance.
- Allowance for start-up and shakedown includes the cost associated with system start-up.
- Spare parts including pumps, valves, controls, special piping and fittings, instruments, spray nozzles, and similar items.

Other Capital Costs

Other capital costs include the following elements:

- Contingency funds set aside for any necessary repairs and/or modifications not covered in projected direct expenditures.
- Land required for the FGD process, waste disposal, regeneration facility, and storage.
- Working capital, including the total amount of money invested in raw materials and supplies in stock, finished products in stock, and unfinished products in the process of being manufactured; accounts receivable; cash kept on hand for payment of operating expenses such as salaries, wages, and raw materials purchases; accounts payable; and taxes payable.

ANNUAL COSTS

The annual cost of an FGD system includes the following direct, fixed and overhead charges:

Direct Costs

- Raw materials, including those required by the FGD process for sulfur dioxide control, absorbent regeneration, sludge treatment, sludge fixation, flocculants, etc.

- Utilities, including water for slurries, cooling and cleaning; electricity for pumps, fans, valves, lighting controls, conveyors, and mixers; fuel for reheating of flue gases; and steam for processing.
- Operating labor, including supervision, skilled, and unskilled labor required to operate, monitor, and control the FGD process.
- Maintenance and repairs, consisting of both manpower and materials to keep the unit operating efficiently. The function of maintenance is both preventive and corrective to keep outages to a minimum.
- Byproduct sales, credit from the sale of byproducts regenerable FGD processes (e.g., sulfur, sulfuric acid) is a negative charge deducted from the annual direct cost to obtain the net annual direct cost of the FGD system.

Overhead

Plant and administrative overhead is a business expense that is not charged directly to a particular part of a project, but is allocated to it. Overhead costs include administrative, safety, engineering, legal and medical services; payroll; employee benefits; recreation; and public relations.

Fixed Charges

- Depreciation - the annual charge to recover direct and indirect costs of physical assets over the life of the asset.
- Interim replacement - costs expended for temporary or provisional replacement of equipment that has failed or malfunctioned prematurely.
- Insurance - including the costs of protection from loss by a specified contingency, peril, or unforeseen event. Required coverage could include losses due to fire, personel injury or death, property damage, explosion, lightning, or other natural phenomena.
- Taxes - including franchises, excise, and property taxes levied by a city, county, state, or Federal government.
- Interest - on borrowed funds.

Table A-5 provides a summary of the means used to determine the missing cost elements if the costs were not reported or insufficient information prevented their actual determination. The assumptions and cost bases for determining the capital and annual costs of FGD systems were developed by the PEDCo staff based upon previous economic studies conducted for the U.S. EPA (Flue Gas Desulfurization Process Cost Assessment, May 1975; Simplified Procedures for Estimating Flue Gas Desulfurization System Costs, June 1976, EPA-600/2-76-150; Particulate and Sulfur Dioxide Emission Control Costs for Large Coal-Fired Boilers, March 1978, EPA-600/7-78-032).

STANDARDIZED ADJUSTED ANNUAL COST

In an attempt to promote further comparability of the figures, the adjustment procedure was carried one step further and standardized adjusted figures were developed. This was done by modifying the fixed annual cost rates such that they would be identical for each unit (i.e., cost of depreciation, interim replacement, taxes, insurance, and capital costs). The newly adjusted total fixed annual cost rate was applied to the total adjusted capital cost in each case and a standardized adjusted annual cost was obtained.

TABLE A-5. COST ELEMENT FACTORS

Category	Value
Indirect capital costs:	
Interest during construction	10% of total direct capital costs
Field overhead	10% of total direct capital costs
Contractor's fee and expenses	5% of total direct capital costs
Engineering	10% of total direct capital costs
Taxes	2% of total direct capital costs
Spares	1% of total direct capital costs
Shakedown allowance	5% of total direct capital costs
Other capital costs:	
Contingency[a]	20% of total direct and indirect capital costs
Direct annual costs:	
Raw materials:	
Fixation chemicals	\$3.50/ton
Lime[b]	\$46/ton
Lime (magnesium promoted)	\$61/ton \$52/ton[c]
Limestone	\$11.60/ton
Magnesium oxide	\$266/ton
Sodium carbonate	\$110/ton
Salt cake (credit)	\$60/ton
Sulfur (credit)	\$87/ton
Sulfuric acid (credit)	\$35/ton
Utilities:	
Electricity	\$30 mills/kWh
Water	\$0.24/10^3 gal
Steam	\$1.45/10^6 Btu

(continued)

TABLE A-5 (continued)

Category	Value
Operating labor:	
Direct labor	$13.30/man-hour
Supervision	15% of direct labor costs
Maintenance:	
Labor and materials	4% of total direct capital costs
Supplies	15% of labor and materials costs
Overhead:	
Plant	50% of operation and maintenance costs
Payroll	20% of operating labor costs
Fixed annual costs:	
Depreciation	3.33% or 5% (new or retrofit)
Interim replacement[d]	0.7% or 0.35%
Taxes	4%
Insurance	0.3%
Capital costs	9%

[a] Contingency costs are used only when the cost data supplied are incomplete (such as equipment costs or direct costs only) and a contingency cost must be factored in to give an accurate estimate of the total capital cost.

[b] Estimated cost for carbide lime used by Louisville Gas and Electric was $13.30/ton in 1978. This was escalated to $15.40/ton for 1980.

[c] Long term contract (e.g., Dravo contract).

[d] Some system components have life spans less than the expected service life of the system. Interim replacement is an allowance factor used in estimating annual revenue requirements to provide for the replacement of these short-lived items. An average allowance of 0.35% of the total investment is normally provided and used for systems with an expected service life of 20 years or less. A higher allowance of 0.70% of the total investment is provided and used for systems with an expected service life of 30 years or more.

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	 ADJUSTED	 STANDARDIZED ADJUSTED
ALABAMA ELECTRIC COOP	CAPACITY FACTOR, %	65	65	65
TOMBIGBEE	DIRECT CAPITAL, $	5826750.	**********	**********
2	INDIRECT CAPITAL, $	1165350.	**********	**********
255MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
179MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	27.4(1978)	35.1(1980)	35.1(1980)
	DIRECT ANNUAL, $	434929.	2038050.	2038050.
	OVERHEAD COST, $	**********	307900.	307900.
	FIXED CHARGES, $	**********	1551000.	1551000.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.3(1978)	2.9(1980)	2.9(1980)
ALABAMA ELECTRIC COOP	CAPACITY FACTOR, %	65	65	65
TOMBIGBEE	DIRECT CAPITAL, $	5826750.	**********	**********
3	INDIRECT CAPITAL, $	1165350.	**********	**********
255MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
179MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	27.4(1978)	35.1(1980)	35.1(1980)
	DIRECT ANNUAL, $	**********	2038050.	2038050.
	OVERHEAD COST, $	434929.	307900.	307900.
	FIXED CHARGES, $	**********	1551000.	1551000.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.3(1978)	2.9(1980)	2.9(1980)
ARIZONA ELECTRIC POWER COOP	CAPACITY FACTOR, %	65	65	65
APACHE	DIRECT CAPITAL, $	6154982.	**********	**********
2	INDIRECT CAPITAL, $	1895044.	**********	**********
195MW (GROSS)	OTHER CAPITAL, $	78949.	**********	**********
98MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	41.8(1977)	62.0(1980)	62.0(1980)
	DIRECT ANNUAL, $	48237.	1437300.	1437300.
	OVERHEAD COST, $	3547.	20300.	20300.
	FIXED CHARGES, $	**********	1973800.	1973800.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(1979)	3.4(1980)	3.4(1980)
ARIZONA ELECTRIC POWER COOP	CAPACITY FACTOR, %	65	65	65
APACHE	DIRECT CAPITAL, $	5449433.	**********	**********
3	INDIRECT CAPITAL, $	1677814.	**********	**********
195MW (GROSS)	OTHER CAPITAL, $	69899.	**********	**********
98MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	37.0(1977)	58.4(1980)	58.4(1980)
	DIRECT ANNUAL, $	48237.	1437300.	1437300.
	OVERHEAD COST, $	3547.	20300.	20300.
	FIXED CHARGES, $	**********	1973800.	1973800.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(1979)	3.4(1980)	3.4(1980)
ARIZONA PUBLIC SERVICE	CAPACITY FACTOR, %	***	65	65
CHOLLA	DIRECT CAPITAL, $	**********	**********	**********
1	INDIRECT CAPITAL, $	**********	**********	**********
119MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
119MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	52.0(1973)	74.6(1980)	74.6(1980)
	DIRECT ANNUAL, $	**********	1322600.	1322600.
	OVERHEAD COST, $	**********	346500.	346500.
	FIXED CHARGES, $	**********	1365700.	1213700.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(1978)	4.2(1980)	4.0(1980)
ARIZONA PUBLIC SERVICE	CAPACITY FACTOR, %	65	65	65
CHOLLA	DIRECT CAPITAL, $	**********	**********	**********
2	INDIRECT CAPITAL, $	**********	**********	**********
264MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
264MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	168.0(1977)	148.7(1980)	148.7(1980)
	DIRECT ANNUAL, $	1003568.	2785200.	2785200.
	OVERHEAD COST, $	**********	512300.	512300.
	FIXED CHARGES, $	**********	6801800.	6801800.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.8(1978)	7.5(1980)	7.5(1980)

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

		COST		
UNIT DESCRIPTION	COST DESCRIPTION	REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
BASIN ELECTRIC POWER COOP	CAPACITY FACTOR, %	***	65	65
LARAMIE RIVER	DIRECT CAPITAL, $	33600000.	**********	**********
1	INDIRECT CAPITAL, $	**********	**********	**********
570MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
570MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	56.0(1980)	******(0)	******(0)
	DIRECT ANNUAL, $	2818530.	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.9(7800)	******(0)	******(0)
BIG RIVERS ELECTRIC	CAPACITY FACTOR, %	***	65	65
GREEN	DIRECT CAPITAL, $	10454400.	**********	**********
1	INDIRECT CAPITAL, $	**********	**********	**********
242MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
242MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	43.2(1976)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
CENTRAL ILLINOIS LIGHT	CAPACITY FACTOR, %	65	65	65
DUCK CREEK	DIRECT CAPITAL, $	**********	**********	**********
1	INDIRECT CAPITAL, $	**********	**********	**********
416MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
416MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	74.8(1977)	140.4(1980)	140.4(1980)
	DIRECT ANNUAL, $	5163000.	10900200.	10900200.
	OVERHEAD COST, $	**********	555000.	555000.
	FIXED CHARGES, $	**********	5688000.	10123500.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	5.0(1980)	8.0(1980)	10.0(1980)
CENTRAL ILLINOIS PUBLIC SERV	CAPACITY FACTOR, %	***	65	65
NEWTON	DIRECT CAPITAL, $	**********	**********	**********
1	INDIRECT CAPITAL, $	**********	**********	**********
617MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
617MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	174.8(1978)	242.1(1980)	242.1(1980)
	DIRECT ANNUAL, $	**********	12394300.	12394300.
	OVERHEAD COST, $	**********	3737000.	3737000.
	FIXED CHARGES, $	**********	25889000.	25889000.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	12.8(1980)	12.8(1980)
COLORADO UTE ELECTRIC ASSN	CAPACITY FACTOR, %	***	65	65
CRAIG	DIRECT CAPITAL, $	38665500.	**********	**********
1	INDIRECT CAPITAL, $	**********	**********	**********
447MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
447MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	86.5(1979)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
COLORADO UTE ELECTRIC ASSN	CAPACITY FACTOR, %	***	65	65
CRAIG	DIRECT CAPITAL, $	32943900.	**********	**********
2	INDIRECT CAPITAL, $	**********	**********	**********
455MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
400MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	73.7(1979)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	 ADJUSTED	 STANDARDIZED ADJUSTED
COLUMBUS & SOUTHERN OHIO ELEC	CAPACITY FACTOR, %	48	65	65
CONESVILLE	DIRECT CAPITAL, $	20663500.	29391150.	29391150.
5	INDIRECT CAPITAL, $	**********	8082550.	8082550.
411MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
411MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	50.3(1975)	91.2(1980)	91.2(1980)
	DIRECT ANNUAL, $	4724280.	6474800.	6474800.
	OVERHEAD COST, $	443800.	517450.	517450.
	FIXED CHARGES, $	**********	6365350.	6494200.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	5.5(1978)	6.3(1980)	6.3(0)
COLUMBUS & SOUTHERN OHIO ELEC	CAPACITY FACTOR, %	48	65	65
CONESVILLE	DIRECT CAPITAL, $	20663500.	29391150.	29391150.
6	INDIRECT CAPITAL, $	**********	8082550.	8082550.
411MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
411MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	50.3(1975)	91.2(1980)	91.2(1980)
	DIRECT ANNUAL, $	4724280.	6474800.	6474800.
	OVERHEAD COST, $	443800.	517450.	517450.
	FIXED CHARGES, $	**********	6365350.	6494200.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	5.5(1978)	6.3(1980)	6.3(1980)
COMMONWEALTH EDISON	CAPACITY FACTOR, %	***	65	65
POWERTON	DIRECT CAPITAL, $	56250000.	**********	**********
51	INDIRECT CAPITAL, $	**********	**********	**********
450MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
450MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	125.0(1979)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
DUQUESNE LIGHT	CAPACITY FACTOR, %	69	65	65
ELRAMA	DIRECT CAPITAL, $	**********	**********	**********
1-4	INDIRECT CAPITAL, $	**********	**********	**********
510MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
510MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	120.2(1976)	172.3(1980)	172.3(1980)
	DIRECT ANNUAL, $	13441451.	12429100.	12429100.
	OVERHEAD COST, $	**********	4149100.	4149100.
	FIXED CHARGES, $	**********	16338300.	15224300.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	7.2(1979)	11.9(1980)	11.5(1980)
DUQUESNE LIGHT	CAPACITY FACTOR, %	55	65	65
PHILLIPS	DIRECT CAPITAL, $	**********	**********	**********
1-6	INDIRECT CAPITAL, $	**********	**********	**********
408MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
408MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	127.0(1972)	192.7(1980)	192.7(1980)
	DIRECT ANNUAL, $	11886000.	12303100.	12303100.
	OVERHEAD COST, $	**********	4035600.	4035600.
	FIXED CHARGES, $	**********	14687000.	13689300.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	11.3(1979)	16.3(1980)	15.7(1980)
INDIANAPOLIS POWER & LIGHT	CAPACITY FACTOR, %	***	65	65
PETERSBURG	DIRECT CAPITAL, $	**********	**********	**********
3	INDIRECT CAPITAL, $	**********	**********	**********
532MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
532MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	104.9(1976)	148.7(1980)	148.7(1980)
	DIRECT ANNUAL, $	**********	12025700.	12025700.
	OVERHEAD COST, $	**********	3072600.	3072600.
	FIXED CHARGES, $	**********	11177300.	13708600.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(1978)	9.0(1980)	9.8(1980)

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	 ADJUSTED	 STANDARDIZED ADJUSTED
KANSAS CITY POWER & LIGHT	CAPACITY FACTOR, %	35	65	65
HAWTHORN	DIRECT CAPITAL, $	**********	**********	**********
3	INDIRECT CAPITAL, $	**********	**********	**********
90MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
90MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	29.4(1972)	57.5(1980)	57.5(1980)
	DIRECT ANNUAL, $	346441.	1308900.	1308900.
	OVERHEAD COST, $	**********	266750.	266750.
	FIXED CHARGES, $	**********	1036800.	1096900.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	1.1(1978)	4.7(1980)	4.8(1980)
KANSAS CITY POWER & LIGHT	CAPACITY FACTOR, %	35	65	65
HAWTHORN	DIRECT CAPITAL, $	**********	**********	**********
4	INDIRECT CAPITAL, $	**********	**********	**********
90MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
90MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	29.4(1972)	57.5(1980)	57.5(1980)
	DIRECT ANNUAL, $	346441.	1308900.	1308900.
	OVERHEAD COST, $	**********	266750.	266750.
	FIXED CHARGES, $	**********	1036800.	1096900.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	1.1(1978)	4.7(1980)	4.8(1980)
KANSAS CITY POWER & LIGHT	CAPACITY FACTOR, %	21	65	65
LA CYGNE	DIRECT CAPITAL, $	**********	78594900.	78594900.
1	INDIRECT CAPITAL, $	**********	1684200.	1684200.
820MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
820MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	53.7(1972)	91.9(1980)	91.9(1980)
	DIRECT ANNUAL, $	8060047.	26257300.	26257300.
	OVERHEAD COST, $	**********	8569500.	8569500.
	FIXED CHARGES, $	**********	13912400.	13912400.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	5.4(1979)	10.4(1980)	10.4(1980)
KANSAS POWER & LIGHT	CAPACITY FACTOR, %	50	65	65
JEFFREY	DIRECT CAPITAL, $	25530000.	**********	**********
1	INDIRECT CAPITAL, $	1776900.	**********	**********
720MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
540MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	37.9(1978)	50.2(1980)	50.2(1980)
	DIRECT ANNUAL, $	321000.	2146400.	2146400.
	OVERHEAD COST, $	**********	112300.	112300.
	FIXED CHARGES, $	**********	6269700.	6269700.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.1(1978)	2.2(1980)	2.2(1980)
KANSAS POWER & LIGHT	CAPACITY FACTOR, %	***	65	65
JEFFREY	DIRECT CAPITAL, $	20741000.	**********	**********
2	INDIRECT CAPITAL, $	**********	**********	**********
700MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
490MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	29.6(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
KENTUCKY UTILITIES	CAPACITY FACTOR, %	13	65	65
GREEN RIVER	DIRECT CAPITAL, $	**********	**********	**********
1-3	INDIRECT CAPITAL, $	**********	**********	**********
64MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
64MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	62.0(1975)	108.1(1980)	108.1(1980)
	DIRECT ANNUAL, $	364005.	1864100.	1864100.
	OVERHEAD COST, $	**********	400300.	400300.
	FIXED CHARGES, $	**********	1203500.	1198700.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	5.2(1978)	10.1(1980)	10.1(1980)

****** INDICATES COST FIGURES NOT YET AVAILABLE

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UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	 ADJUSTED	 STANDARDIZED ADJUSTED
LOUISVILLE GAS & ELECTRIC	CAPACITY FACTOR, %	47	65	65
CANE RUN	DIRECT CAPITAL, $	10847000.	16791100.	16791100.
4	INDIRECT CAPITAL, $	1800000.	3282700.	3282700.
188MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
188MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	66.6(1975)	105.7(1980)	105.7(1980)
	DIRECT ANNUAL, $	960301.	2174900.	2174900.
	OVERHEAD COST, $	**********	346300.	346300.
	FIXED CHARGES, $	**********	2926800.	3478800.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	1.3(1978)	5.3(1980)	5.8(1980)
LOUISVILLE GAS & ELECTRIC	CAPACITY FACTOR, %	50	65	65
CANE RUN	DIRECT CAPITAL, $	**********	**********	**********
5	INDIRECT CAPITAL, $	**********	**********	**********
200MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
200MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	68.8(1977)	93.9(1980)	93.9(1980)
	DIRECT ANNUAL, $	763443.	1887300.	1887300.
	OVERHEAD COST, $	**********	262400.	262400.
	FIXED CHARGES, $	**********	3164900.	3255100.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.9(1978)	4.9(1980)	5.0(1980)
LOUISVILLE GAS & ELECTRIC	CAPACITY FACTOR, %	***	65	65
CANE RUN	DIRECT CAPITAL, $	**********	**********	**********
6	INDIRECT CAPITAL, $	**********	**********	**********
299MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
299MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	71.5(1978)	80.6(1980)	80.6(1980)
	DIRECT ANNUAL, $	**********	3986300.	3986300.
	OVERHEAD COST, $	**********	819600.	819600.
	FIXED CHARGES, $	**********	4327600.	4021300.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(1978)	6.0(1980)	5.8(1980)
LOUISVILLE GAS & ELECTRIC	CAPACITY FACTOR, %	70	65	65
MILL CREEK	DIRECT CAPITAL, $	**********	**********	**********
3	INDIRECT CAPITAL, $	**********	**********	**********
442MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
442MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	42.6(1977)	60.5(1980)	60.5(1980)
	DIRECT ANNUAL, $	321463.	3990500.	3990500.
	OVERHEAD COST, $	**********	229000.	229000.
	FIXED CHARGES, $	**********	4636000.	4636000.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	1.3(1978)	3.7(1980)	3.7(1980)
LOUISVILLE GAS & ELECTRIC	CAPACITY FACTOR, %	***	65	65
PADDY'S RUN	DIRECT CAPITAL, $	**********	**********	**********
6	INDIRECT CAPITAL, $	**********	**********	**********
72MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
72MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	61.7(1973)	122.0(1980)	122.0(1980)
	DIRECT ANNUAL, $	**********	2032400.	2032400.
	OVERHEAD COST, $	**********	518200.	518200.
	FIXED CHARGES, $	**********	1528700.	1480000.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(1978)	11.3(1980)	11.1(1980)
MINNKOTA POWER COOPERATIVE	CAPACITY FACTOR, %	40	65	65
MILTON R. YOUNG	DIRECT CAPITAL, $	30066200.	**********	**********
2	INDIRECT CAPITAL, $	14052400.	**********	**********
440MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
185MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	100.3(1976)	142.9(1980)	142.9(1980)
	DIRECT ANNUAL, $	754445.	2276400.	2276400.
	OVERHEAD COST, $	**********	570900.	570900.
	FIXED CHARGES, $	**********	10895800.	10895800.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.5(1978)	5.7(1980)	5.7(1980)

****** INDICATES COST FIGURES NOT YET AVAILABLE

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UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	COST ADJUSTED	COST STANDARDIZED ADJUSTED
MONONGAHELA POWER PLEASANTS 1 618MW (GROSS) 618MW (ESC)	CAPACITY FACTOR, %	65	65	65
	DIRECT CAPITAL, $	**********	**********	**********
	INDIRECT CAPITAL, $	**********	**********	**********
	OTHER CAPITAL, $	**********	**********	**********
	TOTAL CAPITAL, $/KW(YEAR)	106.3(1978)	113.4(1980)	113.4(1980)
	DIRECT ANNUAL, $	9015879.	11339000.	11339000.
	OVERHEAD COST, $	**********	2668200.	2668200.
	FIXED CHARGES, $	**********	12141100.	12141100.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	2.7(1979)	7.9(1980)	7.9(1980)
MONONGAHELA POWER PLEASANTS 2 618MW (GROSS) 618MW (ESC)	CAPACITY FACTOR, %	***	65	65
	DIRECT CAPITAL, $	66437500.	**********	**********
	INDIRECT CAPITAL, $	**********	**********	**********
	OTHER CAPITAL, $	**********	**********	**********
	TOTAL CAPITAL, $/KW(YEAR)	106.3(0)	******(0)	******(0)
	DIRECT ANNUAL, $	10104003.	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	2.7(7800)	******(0)	******(0)
MONTANA POWER COLSTRIP 1 360MW (GROSS) 360MW (ESC)	CAPACITY FACTOR, %	71	65	65
	DIRECT CAPITAL, $	**********	**********	**********
	INDIRECT CAPITAL, $	**********	**********	**********
	OTHER CAPITAL, $	**********	**********	**********
	TOTAL CAPITAL, $/KW(YEAR)	101.4(1975)	133.8(1980)	133.8(1980)
	DIRECT ANNUAL, $	**********	4876100.	4876100.
	OVERHEAD COST, $	**********	1172200.	1172200.
	FIXED CHARGES, $	**********	8350200.	8350200.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	3.0(1979)	7.6(1980)	7.6(1980)
MONTANA POWER COLSTRIP 2 360MW (GROSS) 360MW (ESC)	CAPACITY FACTOR, %	71	65	65
	DIRECT CAPITAL, $	**********	**********	**********
	INDIRECT CAPITAL, $	**********	**********	**********
	OTHER CAPITAL, $	**********	**********	**********
	TOTAL CAPITAL, $/KW(YEAR)	101.4(1975)	133.8(1980)	133.8(1980)
	DIRECT ANNUAL, $	**********	4876100.	4876100.
	OVERHEAD COST, $	**********	1172200.	1172200.
	FIXED CHARGES, $	**********	8350200.	8350200.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	3.0(1979)	7.6(1980)	7.6(1980)
NEVADA POWER REID GARDNER 1 125MW (GROSS) 125MW (ESC)	CAPACITY FACTOR, %	56	65	65
	DIRECT CAPITAL, $	2681660.	**********	**********
	INDIRECT CAPITAL, $	2681715.	**********	**********
	OTHER CAPITAL, $	**********	**********	**********
	TOTAL CAPITAL, $/KW(YEAR)	42.9(1973)	79.9(1980)	79.9(1980)
	DIRECT ANNUAL, $	251514.	1359650.	1359650.
	OVERHEAD COST, $	**********	91400.	91400.
	FIXED CHARGES, $	**********	1863700.	1731787.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.5(1978)	5.3(1980)	5.1(1980)
NEVADA POWER REID GARDNER 2 125MW (GROSS) 125MW (ESC)	CAPACITY FACTOR, %	56	65	65
	DIRECT CAPITAL, $	2681660.	**********	**********
	INDIRECT CAPITAL, $	2681715.	**********	**********
	OTHER CAPITAL, $	**********	**********	**********
	TOTAL CAPITAL, $/KW(YEAR)	42.9(1973)	79.9(1980)	79.9(1980)
	DIRECT ANNUAL, $	251514.	1359650.	1359650.
	OVERHEAD COST, $	**********	91400.	91400.
	FIXED CHARGES, $	**********	1863700.	1731787.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.5(1978)	5.3(1980)	5.1(1980)

****** INDICATES COST FIGURES NOT YET AVAILABLE

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COSTS FOR OPERATIONAL FGD SYSTEMS

		COST		
UNIT DESCRIPTION	COST DESCRIPTION	REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
NEVADA POWER	CAPACITY FACTOR, %	59	65	65
REID GARDNER	DIRECT CAPITAL, $	**********	**********	**********
3	INDIRECT CAPITAL, $	**********	**********	**********
125MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
125MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	100.8(1975)	138.5(1980)	138.5(1980)
	DIRECT ANNUAL, $	131824.	1201100.	1201100.
	OVERHEAD COST, $	**********	46900.	46900.
	FIXED CHARGES, $	**********	2999300.	2999300.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.2(1978)	6.8(1980)	6.8(1980)
NORTHERN INDIANA PUB SERVICE	CAPACITY FACTOR, %	23	65	65
DEAN H. MITCHELL	DIRECT CAPITAL, $	11951830.	**********	**********
11	INDIRECT CAPITAL, $	6240210.	**********	**********
116MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
115MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	157.4(1976)	233.6(1980)	233.6(1980)
	DIRECT ANNUAL, $	665890.	1419600.	1419600.
	OVERHEAD COST, $	**********	647200.	647200.
	FIXED CHARGES, $	**********	7924500.	4679100.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	13.0(1978)	18.7(1980)	12.6(1980)
NORTHERN STATES POWER	CAPACITY FACTOR, %	61	65	65
SHERBURNE	DIRECT CAPITAL, $	34982020.	47549700.	47549700.
1	INDIRECT CAPITAL, $	**********	20446350.	20446350.
740MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
740MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	49.3(1972)	94.4(1980)	94.4(1980)
	DIRECT ANNUAL, $	2716759.	6236720.	6236720.
	OVERHEAD COST, $	**********	1318400.	1318400.
	FIXED CHARGES, $	**********	11783700.	11783700.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.8(1978)	5.0(1980)	5.0(1980)
NORTHERN STATES POWER	CAPACITY FACTOR, %	61	65	65
SHERBURNE	DIRECT CAPITAL, $	34982020.	47549700.	47549700.
2	INDIRECT CAPITAL, $	**********	20446350.	20446350.
740MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
740MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	49.3(1972)	94.4(1980)	94.4(1980)
	DIRECT ANNUAL, $	2716759.	6236720.	6236720.
	OVERHEAD COST, $	**********	1318400.	1318400.
	FIXED CHARGES, $	**********	11783700.	11783700.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.8(1978)	5.0(1980)	5.0(1980)
PACIFIC POWER & LIGHT	CAPACITY FACTOR, %	***	65	65
JIM BRIDGER	DIRECT CAPITAL, $	**********	**********	**********
4	INDIRECT CAPITAL, $	**********	**********	**********
550MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
550MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	90.3(1974)	108.6(1980)	108.6(1980)
	DIRECT ANNUAL, $	**********	5842700.	5842700.
	OVERHEAD COST, $	**********	1659800.	1659800.
	FIXED CHARGES, $	**********	10351600.	10351600.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(1978)	6.2(1980)	6.2(1980)
PENNSYLVANIA POWER	CAPACITY FACTOR, %	42	65	65
BRUCE MANSFIELD	DIRECT CAPITAL, $	**********	**********	**********
1	INDIRECT CAPITAL, $	**********	**********	**********
917MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
917MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	120.7(1975)	132.3(1980)	132.3(1980)
	DIRECT ANNUAL, $	9979900.	25909050.	25909050.
	OVERHEAD COST, $	**********	3656850.	3656850.
	FIXED CHARGES, $	**********	21228600.	21022390.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	3.3(1978)	10.8(1980)	10.8(1980)

***** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	COST ADJUSTED	COST STANDARDIZED ADJUSTED
PENNSYLVANIA POWER	CAPACITY FACTOR, %	42	65	65
BRUCE MANSFIELD	DIRECT CAPITAL, $	**********	**********	**********
2	INDIRECT CAPITAL, $	**********	**********	**********
917MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
917MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	120.6(1975)	132.3(1980)	132.3(1980)
	DIRECT ANNUAL, $	9979900.	25909050.	25909050.
	OVERHEAD COST, $	**********	3656850.	3656850.
	FIXED CHARGES, $	**********	21228600.	21022390.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	3.3(1978)	10.8(1980)	10.8(1980)
PENNSYLVANIA POWER	CAPACITY FACTOR, %	***	65	65
BRUCE MANSFIELD	DIRECT CAPITAL, $	**********	**********	**********
3	INDIRECT CAPITAL, $	**********	**********	**********
917MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
917MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	243.0(1979)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
PUBLIC SERVICE OF NEW MEXICO	CAPACITY FACTOR, %	***	65	65
SAN JUAN	DIRECT CAPITAL, $	**********	64359600.	64359600.
1	INDIRECT CAPITAL, $	**********	27674600.	27674600.
361MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
361MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	132.8(1977)	254.9(1980)	254.9(1980)
	DIRECT ANNUAL, $	**********	7660000.	7660000.
	OVERHEAD COST, $	**********	2402700.	2402700.
	FIXED CHARGES, $	**********	17164400.	15949530.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(1978)	15.2(1980)	14.5(1980)
PUBLIC SERVICE OF NEW MEXICO	CAPACITY FACTOR, %	***	65	65
SAN JUAN	DIRECT CAPITAL, $	**********	63362300.	63362300.
2	INDIRECT CAPITAL, $	**********	27245800.	27245800.
350MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
350MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	137.1(1977)	258.9(1980)	258.9(1980)
	DIRECT ANNUAL, $	**********	7584600.	7584600.
	OVERHEAD COST, $	**********	2369900.	2369900.
	FIXED CHARGES, $	**********	16898400.	15702400.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(1978)	15.4(1980)	14.7(1980)
PUBLIC SERVICE OF NEW MEXICO	CAPACITY FACTOR, %	***	65	65
SAN JUAN	DIRECT CAPITAL, $	98790000.	**********	**********
3	INDIRECT CAPITAL, $	**********	**********	**********
534MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
534MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	185.0(1978)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
SALT RIVER PROJECT	CAPACITY FACTOR, %	***	65	65
CORONADO	DIRECT CAPITAL, $	25900000.	**********	**********
1	INDIRECT CAPITAL, $	**********	**********	**********
350MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
280MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	74.0(1978)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST		
		REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
SALT RIVER PROJECT	CAPACITY FACTOR, %	***	65	65
CORONADO	DIRECT CAPITAL, $	25900000.	**********	**********
2	INDIRECT CAPITAL, $	**********	**********	**********
350MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
280MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	74.0(1978)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
SOUTH CAROLINA PUBLIC SERVICE	CAPACITY FACTOR, %	80	65	65
WINYAH	DIRECT CAPITAL, $	6026098.	9463800.	9463800.
2	INDIRECT CAPITAL, $	520000.	2452300.	2452300.
280MW (GROSS)	OTHER CAPITAL, $	100000.	144000.	144000.
140MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	23.7(1976)	43.1(1980)	43.1(1980)
	DIRECT ANNUAL, $	527000.	552000.	552000.
	OVERHEAD COST, $	**********	135700.	135700.
	FIXED CHARGES, $	**********	1788500.	2090000.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.3(1978)	1.7(1980)	1.9(1980)
SOUTH MISSISSIPPI ELEC PWR	CAPACITY FACTOR, %	***	65	65
R.D. MORROW, SR.	DIRECT CAPITAL, $	10250000.	17176000.	17176000.
1	INDIRECT CAPITAL, $	646000.	4880750.	4880750.
200MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
124MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	53.7(1975)	108.7(1980)	108.7(1980)
	DIRECT ANNUAL, $	**********	3194750.	3194750.
	OVERHEAD COST, $	**********	650250.	650250.
	FIXED CHARGES, $	**********	2668850.	3822400.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(1978)	6.4(1980)	7.5(1980)
SOUTH MISSISSIPPI ELEC PWR	CAPACITY FACTOR, %	***	65	65
R.D. MORROW, SR.	DIRECT CAPITAL, $	10250000.	17176000.	17176000.
2	INDIRECT CAPITAL, $	646000.	4880750.	4880750.
200MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
124MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	53.7(1975)	108.7(1980)	108.7(1980)
	DIRECT ANNUAL, $	**********	3194750.	3194750.
	OVERHEAD COST, $	**********	650250.	650250.
	FIXED CHARGES, $	**********	2668850.	3822400.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(1978)	6.4(1980)	7.5(1980)
SOUTHERN ILLINOIS POWER COOP	CAPACITY FACTOR, %	63	65	65
MARION	DIRECT CAPITAL, $	**********	**********	**********
4	INDIRECT CAPITAL, $	**********	**********	**********
173MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
173MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	87.9(1977)	110.9(1980)	110.9(1980)
	DIRECT ANNUAL, $	859453.	2475100.	2475000.
	OVERHEAD COST, $	**********	727000.	727000.
	FIXED CHARGES, $	**********	3323500.	3323500.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	1.0(1978)	7.1(1980)	7.1(1980)
SOUTHERN INDIANA GAS & ELEC	CAPACITY FACTOR, %	65	65	65
A.B. BROWN	DIRECT CAPITAL, $	12495000.	15019500.	15019500.
1	INDIRECT CAPITAL, $	**********	6458400.	6458400.
265MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
265MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	47.2(1978)	81.0(1980)	81.0(1980)
	DIRECT ANNUAL, $	1850565.	2530300.	2530300.
	OVERHEAD COST, $	**********	282200.	282200.
	FIXED CHARGES, $	**********	3722100.	3722100.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	1.3(1978)	4.6(1980)	4.6(1980)

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	COST ADJUSTED	COST STANDARDIZED ADJUSTED
SPRINGFIELD CITY UTILITIES SOUTHWEST 1 194MW (GROSS) 194MW (ESC)	CAPACITY FACTOR, %	43	65	65
	DIRECT CAPITAL, $	**********	**********	**********
	INDIRECT CAPITAL, $	**********	**********	**********
	OTHER CAPITAL, $	**********	**********	**********
	TOTAL CAPITAL, $/KW(YEAR)	86.3(1974)	133.5(1980)	133.5(1980)
	DIRECT ANNUAL, $	778749.	2535700.	2535700.
	OVERHEAD COST, $	**********	465000.	465000.
	FIXED CHARGES, $	**********	4489300.	4489300.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	1.2(1979)	7.6(1980)	7.6(1980)
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK 8 550MW (GROSS) 550MW (ESC)	CAPACITY FACTOR, %	41	65	65
	DIRECT CAPITAL, $	**********	72269300.	72269300.
	INDIRECT CAPITAL, $	**********	7516000.	7516000.
	OTHER CAPITAL, $	**********	**********	**********
	TOTAL CAPITAL, $/KW(YEAR)	87.1(1976)	145.1(1980)	145.1(1980)
	DIRECT ANNUAL, $	**********	4692000.	4692000.
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	14880000.	13826800.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	7.8(1978)	6.7(1980)	6.3(1980)
TEXAS UTILITIES MONTICELLO 3 800MW (GROSS) 800MW (ESC)	CAPACITY FACTOR, %	***	65	65
	DIRECT CAPITAL, $	**********	**********	**********
	INDIRECT CAPITAL, $	**********	**********	**********
	OTHER CAPITAL, $	**********	**********	**********
	TOTAL CAPITAL, $/KW(YEAR)	25.0(1978)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
UTAH POWER & LIGHT HUNTER 1 400MW (GROSS) 360MW (ESC)	CAPACITY FACTOR, %	***	65	65
	DIRECT CAPITAL, $	**********	**********	**********
	INDIRECT CAPITAL, $	**********	**********	**********
	OTHER CAPITAL, $	**********	**********	**********
	TOTAL CAPITAL, $/KW(YEAR)	56.7(1978)	68.9(1980)	68.9(1980)
	DIRECT ANNUAL, $	**********	3639200.	3639200.
	OVERHEAD COST, $	**********	966900.	966900.
	FIXED CHARGES, $	**********	5134000.	5134000.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(1978)	4.3(1980)	4.3(1980)
UTAH POWER & LIGHT HUNTER 2 400MW (GROSS) 360MW (ESC)	CAPACITY FACTOR, %	***	65	65
	DIRECT CAPITAL, $	24400000.	**********	**********
	INDIRECT CAPITAL, $	**********	**********	**********
	OTHER CAPITAL, $	**********	**********	**********
	TOTAL CAPITAL, $/KW(YEAR)	61.0(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
UTAH POWER & LIGHT HUNTINGTON 1 430MW (GROSS) 366MW (ESC)	CAPACITY FACTOR, %	80	65	65
	DIRECT CAPITAL, $	**********	**********	**********
	INDIRECT CAPITAL, $	**********	**********	**********
	OTHER CAPITAL, $	**********	**********	**********
	TOTAL CAPITAL, $/KW(YEAR)	63.0(1977)	82.6(1980)	82.6(1980)
	DIRECT ANNUAL, $	2946400.	4648300.	4648300.
	OVERHEAD COST, $	**********	1517100.	1517100.
	FIXED CHARGES, $	**********	6151800.	6151800.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	1.3(1978)	5.4(1980)	5.4(1980)

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-2
COSTS FOR NON-OPERATIONAL FGD SYSTEMS

		COST		
UNIT DESCRIPTION	COST DESCRIPTION	REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
ARIZONA PUBLIC SERVICE	CAPACITY FACTOR, %	***	65	65
CHOLLA	DIRECT CAPITAL, $	28000000.	**********	**********
4	INDIRECT CAPITAL, $	**********	**********	**********
375MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
126MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	80.0(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
BASIN ELECTRIC POWER COOP	CAPACITY FACTOR, %	75	65	65
ANTELOPE VALLEY	DIRECT CAPITAL, $	**********	**********	**********
1	INDIRECT CAPITAL, $	**********	**********	**********
440MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
440MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	75.2(1981)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.8(1981)	******(0)	******(0)
BASIN ELECTRIC POWER COOP	CAPACITY FACTOR, %	***	65	65
ANTELOPE VALLEY	DIRECT CAPITAL, $	47960000.	**********	**********
2	INDIRECT CAPITAL, $	**********	**********	**********
440MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
440MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	109.0(0)	******(0)	******(0)
	DIRECT ANNUAL, $	1797596.	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.8(7800)	******(0)	******(0)
BASIN ELECTRIC POWER COOP	CAPACITY FACTOR, %	***	65	65
LARAMIE RIVER	DIRECT CAPITAL, $	33600000.	**********	**********
2	INDIRECT CAPITAL, $	**********	**********	**********
570MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
570MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	56.0(1980)	******(0)	******(0)
	DIRECT ANNUAL, $	2818530.	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.9(7800)	******(0)	******(0)
BASIN ELECTRIC POWER COOP	CAPACITY FACTOR, %	75	65	65
LARAMIE RIVER	DIRECT CAPITAL, $	**********	**********	**********
3	INDIRECT CAPITAL, $	**********	**********	**********
570MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
570MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	83.0(1981)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	.6(1981)	******(0)	******(0)
BOSTON EDISON	CAPACITY FACTOR, %	***	65	65
MYSTIC	DIRECT CAPITAL, $	**********	**********	**********
6	INDIRECT CAPITAL, $	**********	**********	**********
150MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
150MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	63.4(1972)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	3.0(1974)	******(0)	******(0)

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-2
COSTS FOR NON-OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	 ADJUSTED	 STANDARDIZED ADJUSTED
CINCINNATI GAS & ELECTRIC	CAPACITY FACTOR, %	***	65	65
EAST BEND	DIRECT CAPITAL, $	78000000.	**********	**********
2	INDIRECT CAPITAL, $	**********	**********	**********
650MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
650MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	120.0(0)	******(0)	******(0)
	DIRECT ANNUAL, $	11718252.	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	3.4(7800)	******(0)	******(0)
COMMONWEALTH EDISON	CAPACITY FACTOR, %	49	65	65
WILL COUNY	DIRECT CAPITAL, $	**********	**********	**********
1A	INDIRECT CAPITAL, $	**********	**********	**********
167MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
167MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	113.0(1972)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	13.1(1975)	******(0)	******(0)
DETROIT EDISON	CAPACITY FACTOR, %	***	65	65
ST. CLAIR	DIRECT CAPITAL, $	**********	**********	**********
6A	INDIRECT CAPITAL, $	**********	**********	**********
325MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
163MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	80.3(1976)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	9.6(1976)	******(0)	******(0)
HOOSIER ENERGY	CAPACITY FACTOR, %	***	65	65
MEROM	DIRECT CAPITAL, $	24500000.	**********	**********
1	INDIRECT CAPITAL, $	**********	**********	**********
490MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
441MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	50.0(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
HOOSIER ENERGY	CAPACITY FACTOR, %	***	65	65
MEROM	DIRECT CAPITAL, $	24500000.	**********	**********
2	INDIRECT CAPITAL, $	**********	**********	**********
490MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
441MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	50.0(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
ILLINOIS POWER COMPANY	CAPACITY FACTOR, %	***	65	65
WOOD RIVER	DIRECT CAPITAL, $	**********	**********	**********
4	INDIRECT CAPITAL, $	**********	**********	**********
110MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
110MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	82.5(1972)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-2
COSTS FOR NON-OPERATIONAL FGD SYSTEMS

			COST	
UNIT DESCRIPTION	COST DESCRIPTION	REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
LAKELAND UTILITIES	CAPACITY FACTOR, %	***	65	65
MCINTOSH	DIRECT CAPITAL, $	11775400.	**********	**********
3	INDIRECT CAPITAL, $	**********	**********	**********
364MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
364MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	32.4(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
MONTANA POWER	CAPACITY FACTOR, %	***	65	65
COLSTRIP	DIRECT CAPITAL, $	76643000.	**********	**********
3	INDIRECT CAPITAL, $	**********	**********	**********
700MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
700MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	109.5(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
MONTANA POWER	CAPACITY FACTOR, %	***	65	65
COLSTRIP	DIRECT CAPITAL, $	70686000.	**********	**********
4	INDIRECT CAPITAL, $	**********	**********	**********
700MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
700MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	101.0(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
PHILADELPHIA ELECTRIC	CAPACITY FACTOR, %	65	65	65
EDDYSTONE	DIRECT CAPITAL, $	**********	**********	**********
1A	INDIRECT CAPITAL, $	**********	**********	**********
120MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
120MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	285.7(1973)	187.1(1980)	187.1(1980)
	DIRECT ANNUAL, $	**********	2527900.	2527900.
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	3768500.	3501800.
	TOTAL ANNUAL, MILLS/KWH (YEAR)	6.4(1979)	10.5(1980)	10.1(1980)
PUBLIC SERVICE OF COLORADO	CAPACITY FACTOR, %	***	65	65
VALMONT	DIRECT CAPITAL, $	**********	**********	**********
5A	INDIRECT CAPITAL, $	**********	**********	**********
166MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
166MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	87.0(1974)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
SOUTH CAROLINA PUBLIC SERVICE	CAPACITY FACTOR, %	***	65	65
CROSS	DIRECT CAPITAL, $	**********	**********	**********
1	INDIRECT CAPITAL, $	**********	**********	**********
500MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
500MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	40.0(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-2
COSTS FOR NON-OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	-COST- REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
SOUTH CAROLINA PUBLIC SERVICE	CAPACITY FACTOR, %	***	65	65
CROSS	DIRECT CAPITAL, $	**********	**********	**********
2	INDIRECT CAPITAL, $	**********	**********	**********
500MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
500MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	40.0(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
TENNESSEE VALLEY AUTHORITY	CAPACITY FACTOR, %	***	65	65
PARADISE	DIRECT CAPITAL, $	52500000.	**********	**********
1	INDIRECT CAPITAL, $	**********	**********	**********
704MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
704MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	74.6(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
TENNESSEE VALLEY AUTHORITY	CAPACITY FACTOR, %	***	65	65
PARADISE	DIRECT CAPITAL, $	52500000.	**********	**********
2	INDIRECT CAPITAL, $	**********	**********	**********
704MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
704MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	74.6(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)
TENNESSEE VALLEY AUTHORITY	CAPACITY FACTOR, %	***	65	65
WIDOWS CREEK	DIRECT CAPITAL, $	25875000.	**********	**********
7	INDIRECT CAPITAL, $	**********	**********	**********
575MW (GROSS)	OTHER CAPITAL, $	**********	**********	**********
575MW (ESC)	TOTAL CAPITAL, $/KW(YEAR)	45.0(0)	******(0)	******(0)
	DIRECT ANNUAL, $	**********	**********	**********
	OVERHEAD COST, $	**********	**********	**********
	FIXED CHARGES, $	**********	**********	**********
	TOTAL ANNUAL, MILLS/KWH (YEAR)	******(0)	******(0)	******(0)

****** INDICATES COST FIGURES NOT YET AVAILABLE

APPENDIX B

DEFINITIONS

DEFINITIONS

Boiler Commercial Service Date	Date when boiler and auxiliary equipment (including FGD system for new boilers) has met initial supplier guarantees and begins to contribute electrical power to the power grid.
Byproduct Nature	The nature (e.g. elemental sulfur, sulfuric acid) and disposition (e.g. stockpile on site, marketed) of the end product by systems that generate a saleable product.
Commercial Service Date (FGD System)	Date when the FGD system successfully completes compliance testing and the utility is satisfied that the system meets supplier contractual guarantees.
Company Name	Name of corporation as it appears in Electrical World - Directory of Electrical Utilities, McGraw-Hill - Current Edition - as space permits.
Disposal	Disposal method for throwaway product systems producing sludge including: interim and final disposal sites and disposal type (minefill, landfill, etc.) as well as disposal location and site capacity.
Efficiency:	
Total Unit Design Particle Removal Efficiency	The actual percentage of particulate matter removed by the emission control system (mechanical collectors, ESP, or fabric filter and FGD) from the untreated flue gas.
Total Unit SO_2 Design Removal Efficiency	The actual percentage of SO_2 removed from the flue gas by the FGD system.

FGD Viability Indexes

Several parameters have been developed to quantify the viability of FGD system technology. Various terms such as "availability," "reliability," "operability," and "utilization" are used to accurately represent the operation of any FGD system during a given period. The above-mentioned parameters are defined below and discussed briefly. The objectives of this discussion are to make the reader aware that several different definitions are being used and to select appropriate parameters that can be used for reporting purposes so that reasonably consistent comparisons can be made.

Availability Index

Hours the FGD system is available for operation (whether operated or not) divided by hours in period, expressed as a percentage. This parameter tends to overestimate the viability of the FGD system because it does not penalize for election not to operate the system when it could have been operated. Boiler downtime may tend to increase the magnitude of the parameter because FGD failures generally cannot occur during such periods.

Reliability Index

Hours the FGD system was operated divided by the hours the FGD system was called upon to operate, expressed as a percentage. This parameter has been developed in order not to penalize the FGD system for elected outages, e.g., periods when the FGD system could have been run but was not run because of chemical shortages, lack of manpower, short duration boiler operations, etc. The main problem in using this

	formula is the concise determination whether or not the system was "called upon to operate" during a given time period. In addition, an undefined value can result when the FGD system is not called upon to operate for a given period (e.g., turbine or boiler outage when FGD system is available).
FGD Operability Index	Hours the FGD system was operated divided by boiler operating hours in period, expressed as a percentage. This parameter indicates the degree to which the FGD system is actually used, relative to boiler operating time. The parameter is penalized when options are exercised not to use the FGD system in periods when the system is operable. In addition, an undefined value can result when the FGD system is not called upon to operate for a given period (e.g., turbine or boiler outage when FGD system is available).
FGD Utilization Index	Hours that the FGD system operated divided by total hours in period. This parameter is a relative stress factor for the FGD system. It is not a complete measure of FGD system viability because the parameter can be strongly influenced by conditions that are external to the FGD system (e.g., infrequent boiler operation will lower the value of the parameter although the FGD system may be highly dependable in its particular application).
End Product	
Sludge	The SO_2 removed from the flue gas is not recovered in a usable or marketable form and resulting sulfur-bearing waste

	products must be disposed in an environmentally acceptable fashion.
Recoverable Byproduct	The SO_2 removed from the flue gas is recovered in a usable or marketable form (e.g., sulfur, sulfuric acid, gypsum, ammonium sulfate, sodium sulfate).
Energy Consumption, %	The percentage of gross unit electrical generating capacity consumed by the FGD system, as defined by the following equation: [Net MW w/o FGD - Net MW w/FGD]/[Gross unit rating]
Equivalent Scrubbed Capacity (ESC)	The effective scrubbed flue gas in equivalent MW based on the percent of flue gas scrubbed by the FGD system.
FGD Status:	
Category 1	Operational - FGD system is in service removing SO_2.
Category 2	Under construction - ground has been broken for installation of FGD system, but FGD system has not become operational.
Category 3	Planned, Contract Awarded - contract has been signed for purchase of FGD system but ground has not been broken for installation.
Cateogry 4	Planned, Letter of Intent Signed - letter of intent has been signed, but legal contract for purchase has not been awarded.
Category 5	Planned, Requesting/Evaluating Bids - bid requests have been released but no letter of intent or contract has been issued.

Category 6	Considering only FGD Systems - an FGD system is proposed as a means to meet an SO_2 regulation.
Category 7	Considering an FGD system as well as alternative methods.
Category 8	Nonoperational - FGD system has been operated in the past but has been shut down permanently or for an extended indefinite period of time.
Fuel Firing Rate - TPH	Boiler fuel firing rate in terms of tons per hour at maximum continuous load.
Initial Start-Up (FGD System)	Date when flue gas first passes through any component of the FGD system (or is scheduled to do so).
New	FGD unit and boiler were designed at the same time or space for addition of an FGD unit was reserved when boiler was constructed.
Plant Name	Unit identification as it appears in Electrical World - Directory of Electrical Utilities, McGraw-Hill - Current Edition - or as indicated by utility representative for installations in planning stages.
Process Additives	A chemical compound or element which is added to the process or normally found with the main process reagent in small quantities (e.g., Mg, adipic acid) to promote improved process operation (e.g., scale reduction, increased SO_2 removal efficiency).
Process Type	Company name if process is patented. Generic name if several companies have similar processes (e.g., Lime, Limestone, Wellman Lord, Thoroughbred 121).

Regulatory Class	A. Unit(s) subject to Federal New Source Performance Standards (NSPS) promulgated in June 1979. B. Unit(s) subject to Federal New Source Performance Standards (NSPS) promulgated in December 1971. C. Unit(s) subject to standard(s) more stringent than NSPS (6/79). D. Unit(s) subject to standard(s) more stringent than NSPS (12/71), but not more stringent than NSPS (6/79) E. Unit(s) subject to standard(s) equal to or less stringent than NSPS (12/71).
Retrofit	FGD unit will be/was added to an existing boiler not specifically designed to accommodate FGD unit.
SO_2 Removal Mode	The manner in which the SO_2 from the flue gas is collected, e.g., wet scrubbing, spray drying, dry adsorption.
Spare Capacity Index - %	The summation of the individual component capacities (%) minus 100%.
Spare Component Index	The equipment spare capacity index (%) divided by the individual component capacity (%).
System Supplier	A firm that fabricates and supplies flue gas desulfurization systems.
Total Controlled Capacity (TCC)	The gross rating (MW) of a unit brought into compliance with FGD, regardless of the

	percent of flue gas treated at the facility. In the case of prototype and demonstration FGD systems, this figure will be identical to the Equivalent Scrubbed Capacity rather than the gross unit rating if the system is not meant to bring the facility into compliance with SO_2 emission standards.
Unit Rating Gross	Operational - Maximum continuous gross generation capacity in MW; Preoperational - maximum continuous design generation capacity in MW.
Net w/FGD	Gross unit rating less the energy required to operate ancillary station equipment, inclusive of emission control systems.
Net w/o FGD	Gross unit rating less the energy required to operate ancillary station equipment, exclusive of emission control systems.

APPENDIX C

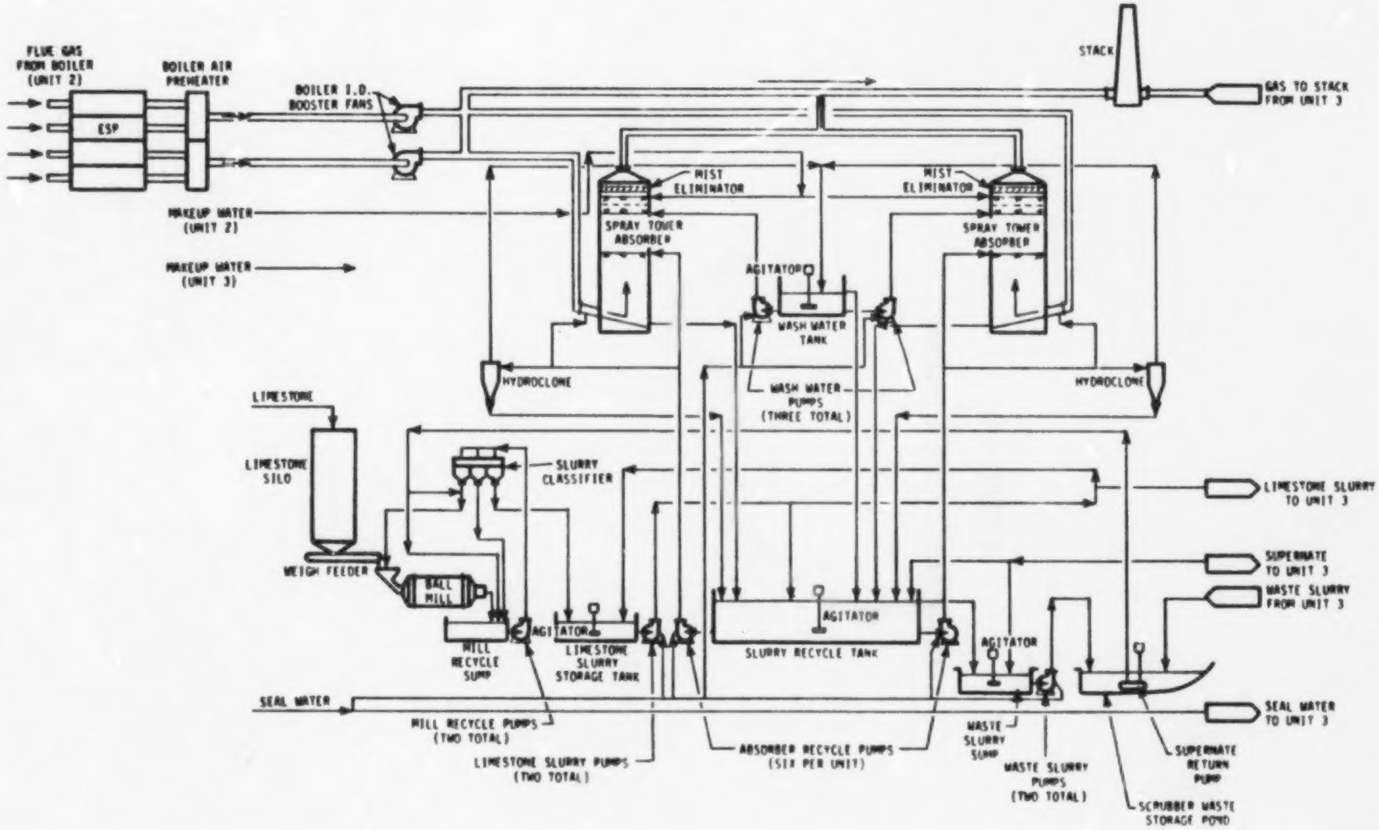
TABLE OF UNIT NOTATION

TABLE OF UNIT NOTATION

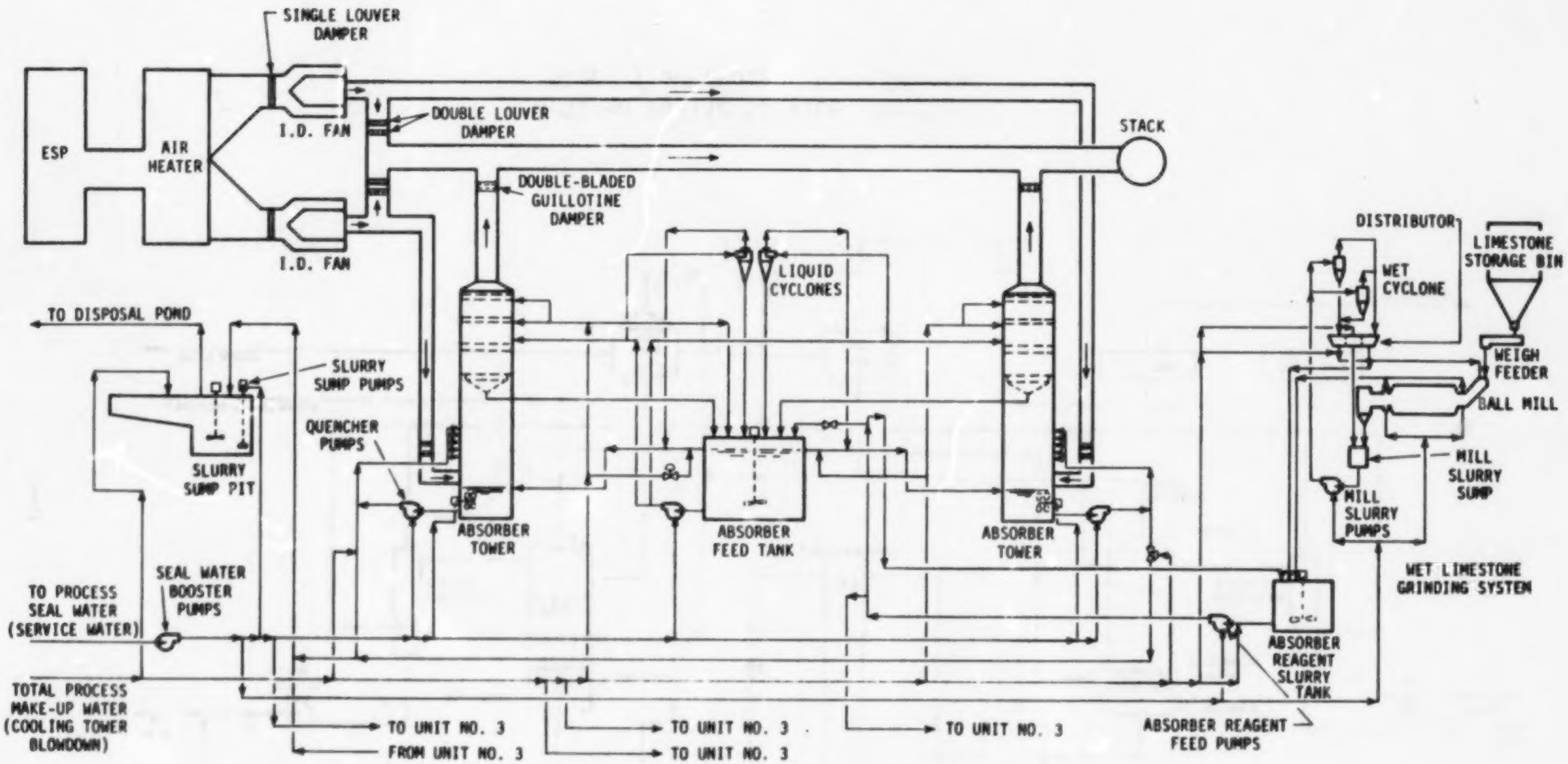
Classification	English Unit	Symbol	Survey Report Notation	ASTM/SI Unit	Symbol	Survey Report Notation
Area	Acre	acre	ACRE	Square meter	M^2	SQ.M
	Square foot	ft^2	SQ.FT	Square meter	M^2	SQ.M
Concentration	Grains per standard cubic foot	gr/scf	GR/SCF	Grams per cubic meter	g/m^3	G/CU.M
	Parts per million	ppm	PPM	Parts per million	ppm	PPM
	Pounds per million Btu	lb/10^6 Btu	LB/MMBTU	Nanograms per joule	ng/J	NG/J
Flow	Actual cubic feet per minute	ft^3/min (actual)	ACFM	Cubic meters per second	m^3/s	CU.M/S
	Gallons per minute	gal/min	GPM	Liters per second	liter/s	LITER/S
	Pounds per minute	lb/min	LB/MIN	Kilogram per second	kg/s	KG/S
	Ton per day	t/day	TPD	Metric ton per day	M t/d	M T/D
	Ton per hour	t/h	TPH	Metric ton per hour	M t/h	M T/H
Heat Content	Btu per pound	Btu/lb	BTU/LB	Joules per gram	J/g	J/G
Length	Foot	ft	FT	Meter	m	M
	Inch	in	IN	Centimeter	cm	CM
	Mile	mi	MI	Kilometer	km	KM
L/G Ratio	Gallons per thousand actual cubic feet	gal/1000 ft^3 (actual)	GAL/1000ACF	Liters per cubic meter	liter/m^3	LITER/CU.M
Mass/Weight	Pound	lb	LB	Kilogram	kg	KG
	Ton	t	T	Megagram	Mg	MG
Pressure	Inches of water	in. H_2O	IN. H_2O	Kilopascal	kPa	KPA
Temperature	Degree Fahrenheit	°F	F	Degree Celsius	°C	C
Volume	Cubic feet	ft^3	CU.F	Cubic meter	m^3	CU.M
	Acre-feet	Acre-ft	ACRE-FT	Cubic meter	m^3	CU.M

APPENDIX D

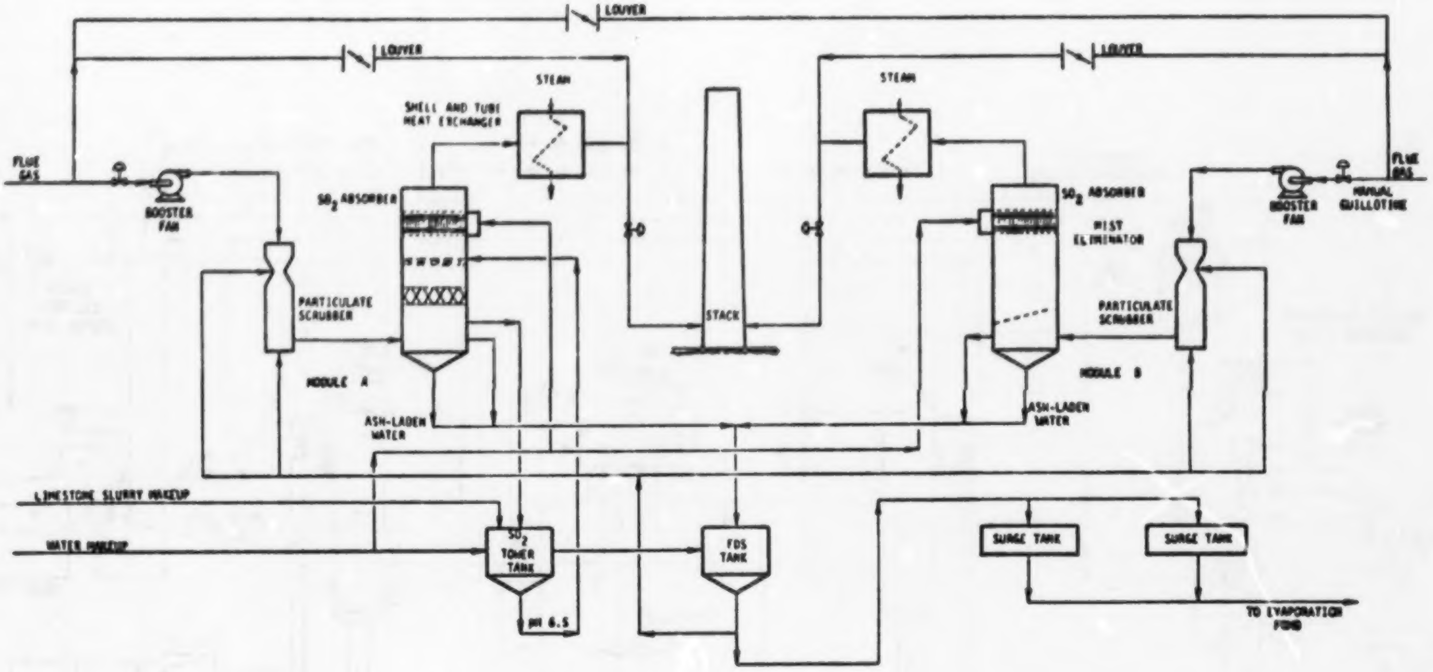
FGD PROCESS FLOW DIAGRAMS


FLUE GAS FROM BOILER (UNIT 2)
ESP
BOILER AIR PREHEATER
BOILER I.D. BOOSTER FANS
STACK
GAS TO STACK FROM UNIT 3
MIST ELIMINATOR
MIST ELIMINATOR
SPRAY TOWER ABSORBER
SPRAY TOWER ABSORBER
MAKEUP WATER (UNIT 2)
MAKEUP WATER (UNIT 3)
AGITATOR
WASH WATER TANK
WASH WATER PUMPS (THREE TOTAL)
HYDROCLONE
HYDROCLONE
LIMESTONE
LIMESTONE SILO
SLURRY CLASSIFIER
WEIGH FEEDER
BALL MILL
MILL RECYCLE SUMP
AGITATOR
LIMESTONE SLURRY STORAGE TANK
AGITATOR
SLURRY RECYCLE TANK
AGITATOR
LIMESTONE SLURRY TO UNIT 3
SUPERNATE TO UNIT 3
WASTE SLURRY FROM UNIT 3
SEAL WATER
SEAL WATER TO UNIT 3
MILL RECYCLE PUMPS (TWO TOTAL)
LIMESTONE SLURRY PUMPS (TWO TOTAL)
ABSORBER RECYCLE PUMPS (SIX PER UNIT)
WASTE SLURRY SUMP
WASTE SLURRY PUMPS (TWO TOTAL)
SUPERNATE RETURN PUMP
SCRUBBER WASTE STORAGE POND

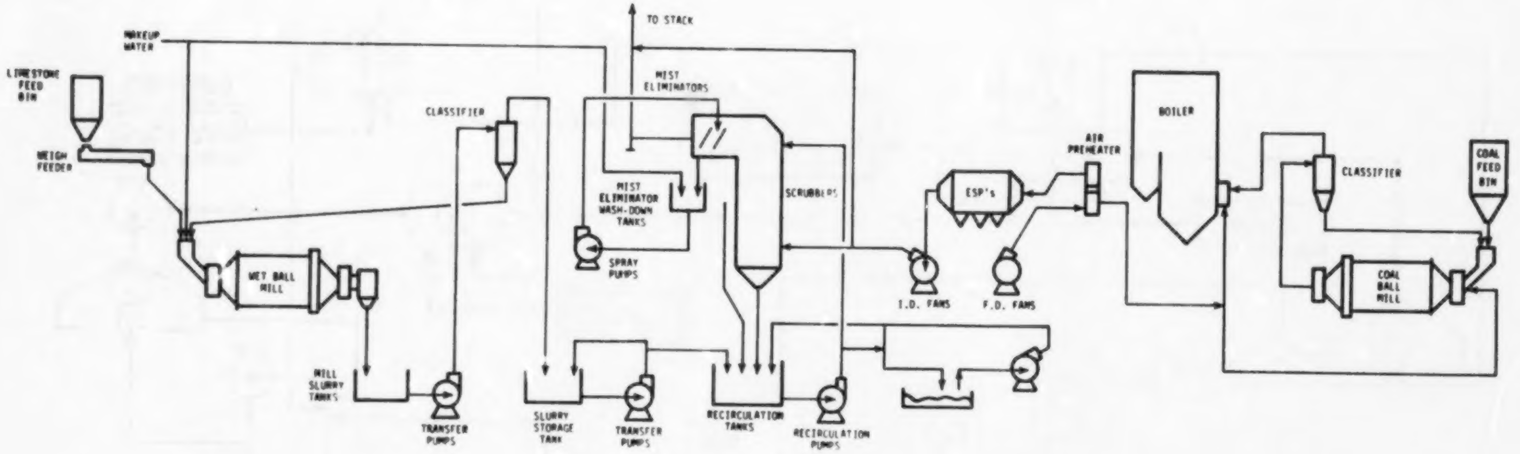
Alabama Electric,
Simplified Process Flow Diagram for Tombigbee 2 and 3


SINGLE LOUVER DAMPER
DOUBLE LOUVER DAMPER
STACK
ESP
AIR HEATER
I.D. FAN
I.D. FAN
DOUBLE-BLADED GUILLOTINE DAMPER
DISTRIBUTOR
LIMESTONE STORAGE BIN
WET CYCLONE
LIQUID CYCLONES
WEIGH FEEDER
BALL MILL
TO DISPOSAL POND
SLURRY SUMP PUMPS
QUENCHER PUMPS
SLURRY SUMP PIT
ABSORBER TOWER
ABSORBER FEED TANK
ABSORBER TOWER
MILL SLURRY SUMP
MILL SLURRY PUMPS
WET LIMESTONE GRINDING SYSTEM
TO PROCESS SEAL WATER (SERVICE WATER)
SEAL WATER BOOSTER PUMPS
ABSORBER REAGENT SLURRY TANK
TOTAL PROCESS MAKE-UP WATER (COOLING TOWER BLOWDOWN)
TO UNIT NO. 3
FROM UNIT NO. 3
TO UNIT NO. 3
TO UNIT NO. 3
TO UNIT NO. 3
ABSORBER REAGENT FEED PUMPS

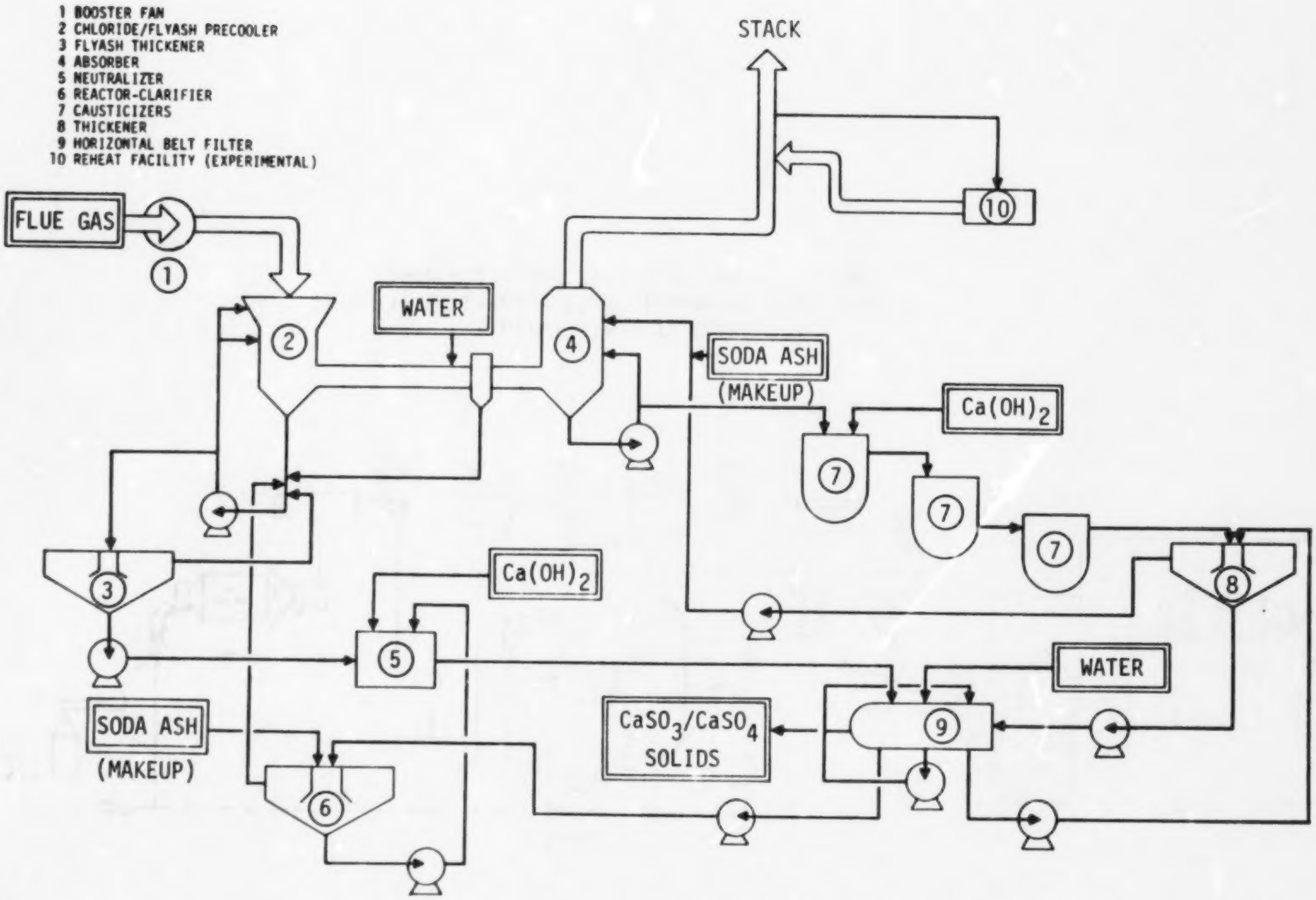
Arizona Electric Power Coop, Apache 2 and 3
Process Flow Diagram


LOUVER
LOUVER
LOUVER
FLUE GAS
BOOSTER FAN
STEAM
SHELL AND TUBE HEAT EXCHANGER
SO_2 ABSORBER
PARTICULATE SCRUBBER
MODULE A
ASH-LADEN WATER
STACK
STEAM
SO_2 ABSORBER
MIST ELIMINATOR
PARTICULATE SCRUBBER
MODULE B
ASH-LADEN WATER
BOOSTER FAN
MANUAL GUILLOTINE
FLUE GAS
LIMESTONE SLURRY MAKEUP
WATER MAKEUP
SO_2 TOWER TANK
pH 6.5
FDS TANK
SURGE TANK
SURGE TANK
TO EVAPORATION POND

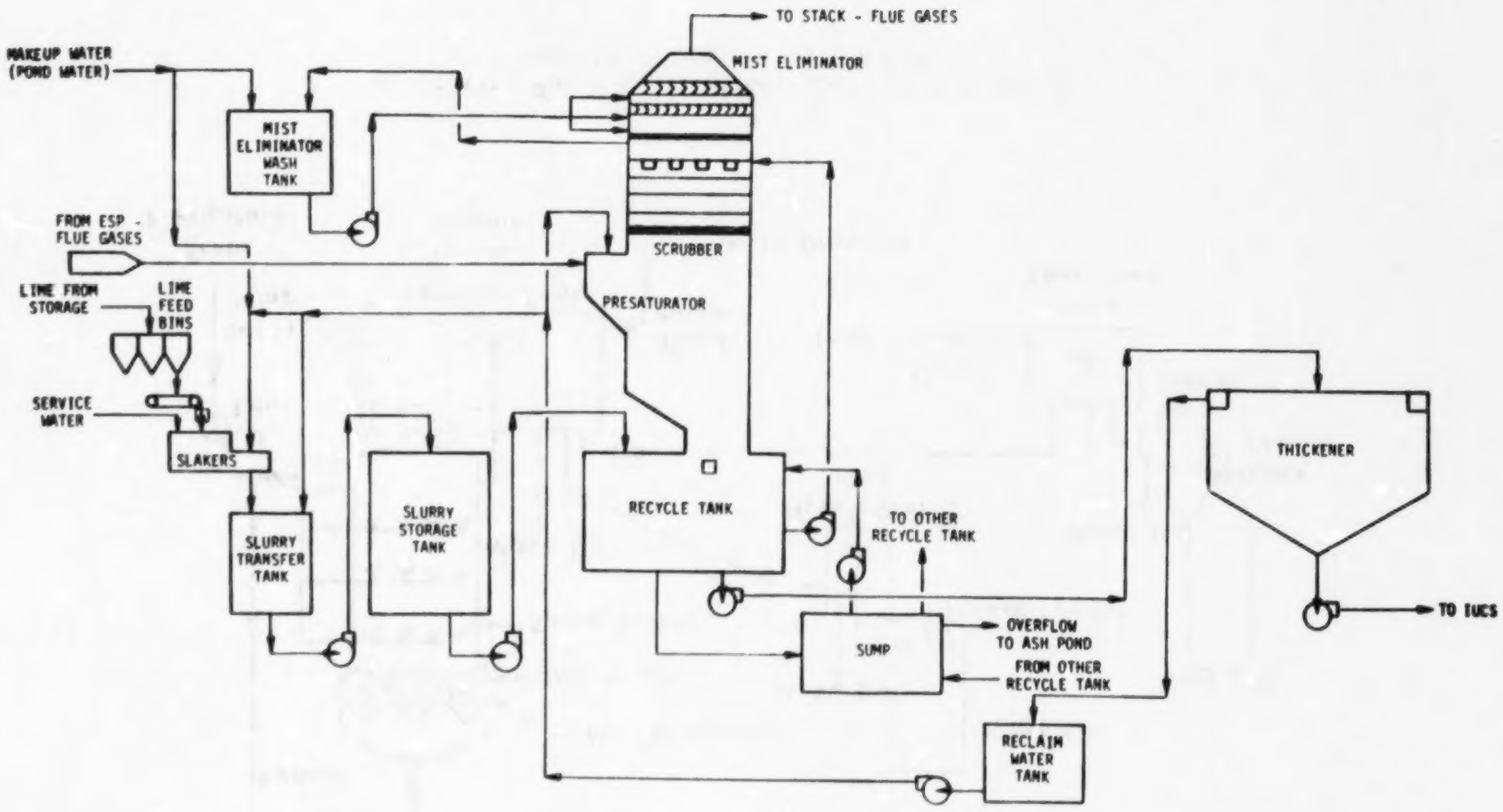
Arizona Public Service, Cholla 1:
Simplified Process Flow Diagram


TO STACK
MAKEUP WATER
LIMESTONE FEED BIN
WEIGH FEEDER
WET BALL MILL
CLASSIFIER
MILL SLURRY TANKS
TRANSFER PUMPS
MIST ELIMINATORS
MIST ELIMINATOR WASH-DOWN TANKS
SPRAY PUMPS
SCRUBBERS
SLURRY STORAGE TANK
TRANSFER PUMPS
RECIRCULATION TANKS
RECIRCULATION PUMPS
ESP's
I.D. FANS
F.D. FANS
AIR PREHEATER
BOILER
CLASSIFIER
COAL FEED BIN
COAL BALL MILL

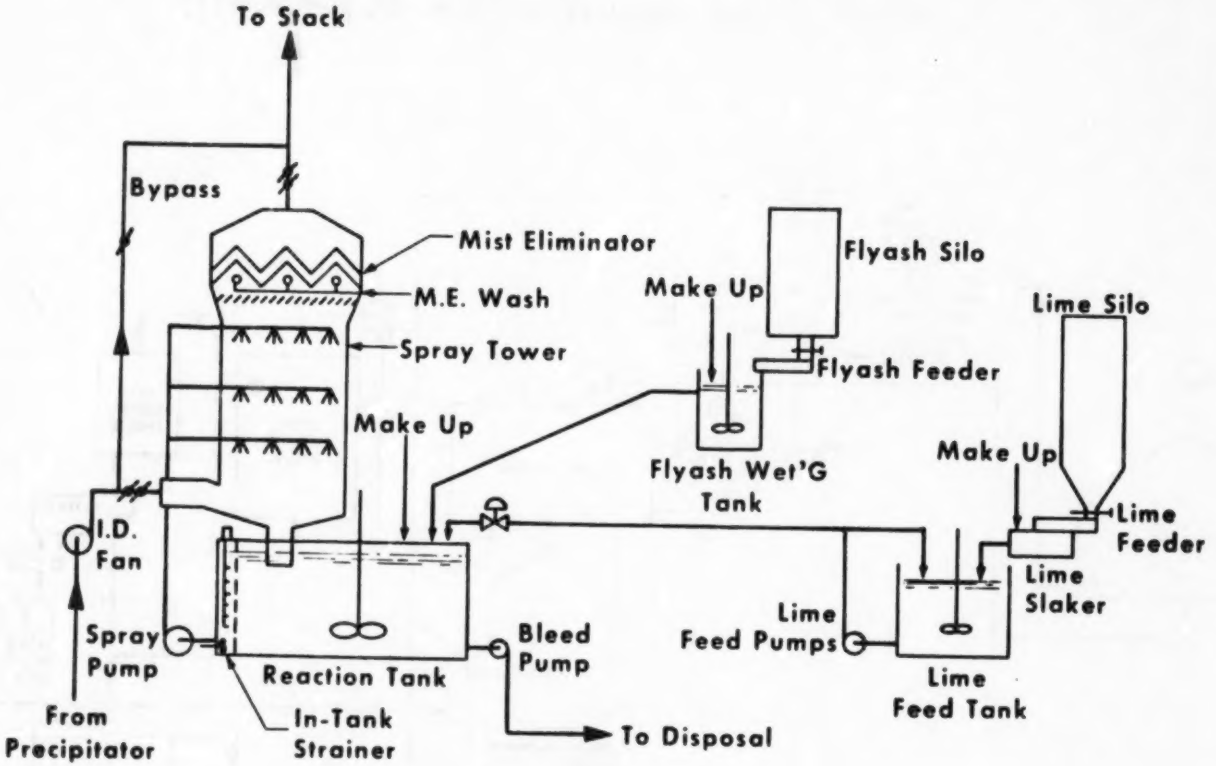
Central Illinois Light,
Simplified Process Flow Diagram of Duck Creek 1
Power Plant and Emission Control System


1 BOOSTER FAN
2 CHLORIDE/FLYASH PRECOOLER
3 FLYASH THICKENER
4 ABSORBER
5 NEUTRALIZER
6 REACTOR-CLARIFIER
7 CAUSTICIZERS
8 THICKENER
9 HORIZONTAL BELT FILTER
10 REHEAT FACILITY (EXPERIMENTAL)
STACK
FLUE GAS
①
②
WATER
④
SODA ASH (MAKEUP)
Ca(OH)2
⑩
⑦
⑦
⑦
③
⑧
Ca(OH)2
⑤
WATER
SODA ASH (MAKEUP)
CaSO3/CaSO4 SOLIDS
⑨
⑥

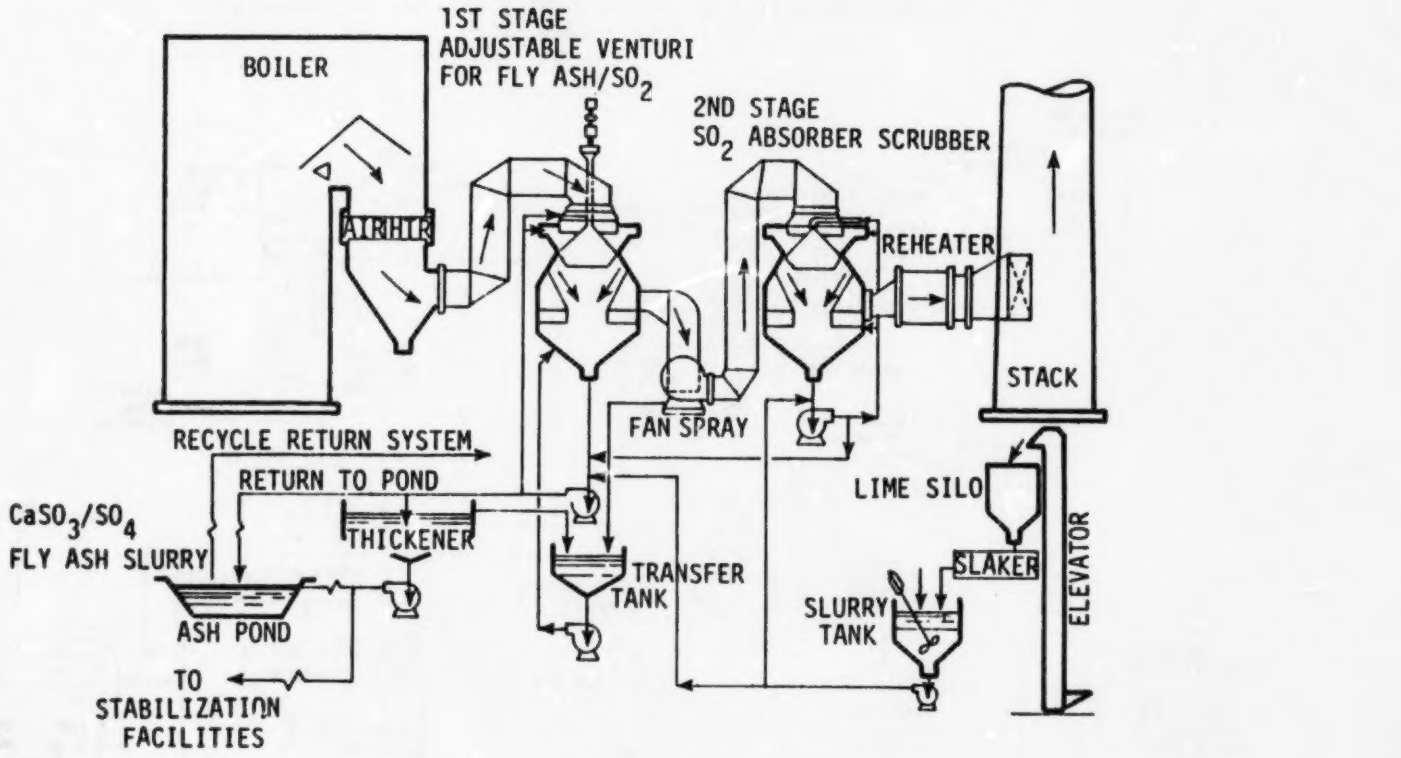
Central Illinois Public Service, Newton 1:
Simplified Process Flow Diagram Showing One of Four Absorbers


TO STACK - FLUE GASES
MIST ELIMINATOR
MAKEUP WATER (POND WATER)
MIST ELIMINATOR WASH TANK
FROM ESP - FLUE GASES
SCRUBBER
PRESATURATOR
LIME FROM STORAGE
LIME FEED BINS
SERVICE WATER
SLAKERS
SLURRY TRANSFER TANK
SLURRY STORAGE TANK
RECYCLE TANK
TO OTHER RECYCLE TANK
SUMP
OVERFLOW TO ASH POND
FROM OTHER RECYCLE TANK
RECLAIM WATER TANK
THICKENER
TO IUCS

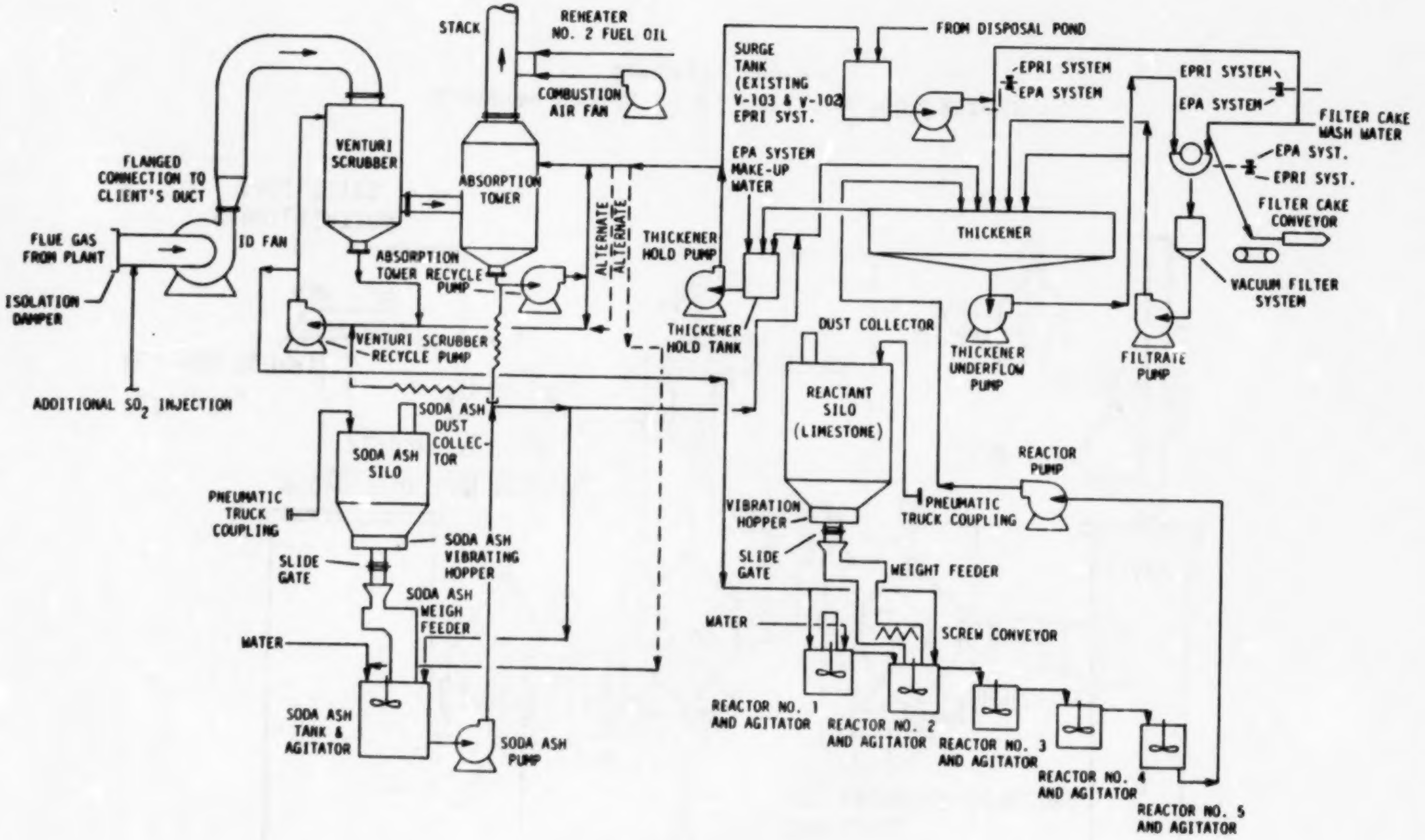
Columbus and Southern Ohio Electric, Conesville 5 and 6:
Simplified Process Flow Diagram for a Given Module


To Stack
Bypass
Mist Eliminator
M.E. Wash
Spray Tower
Make Up
I.D. Fan
Spray Pump
From Precipitator
Reaction Tank
In-Tank Strainer
Bleed Pump
To Disposal
Make Up
Flyash Silo
Flyash Feeder
Flyash Wet'G Tank
Lime Silo
Make Up
Lime Feeder
Lime Slaker
Lime Feed Pumps
Lime Feed Tank

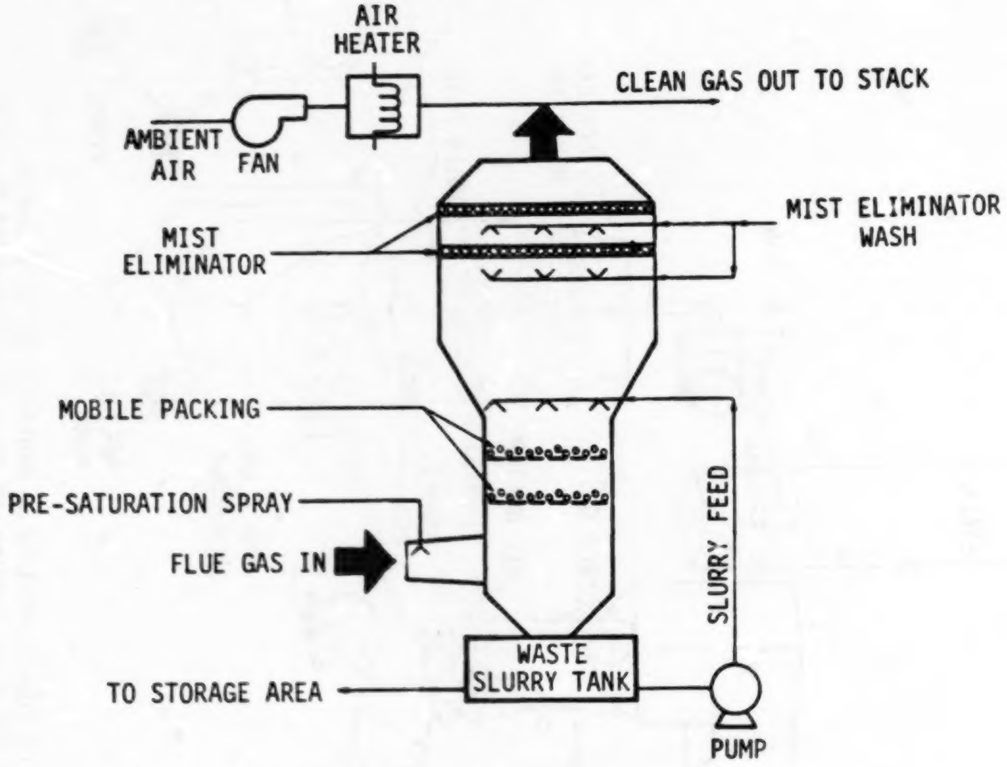
Cooperative Power Association, Coal Creek 1 and 2:
Simplified Process Flow Diagram


1ST STAGE
ADJUSTABLE VENTURI
FOR FLY ASH/SO_2
BOILER
AIRHTR
2ND STAGE
SO_2 ABSORBER SCRUBBER
REHEATER
STACK
FAN SPRAY
RECYCLE RETURN SYSTEM
RETURN TO POND
$CaSO_3/SO_4$
FLY ASH SLURRY
THICKENER
ASH POND
TRANSFER
TANK
LIME SILO
SLAKER
SLURRY
TANK
ELEVATOR
TO
STABILIZATION
FACILITIES

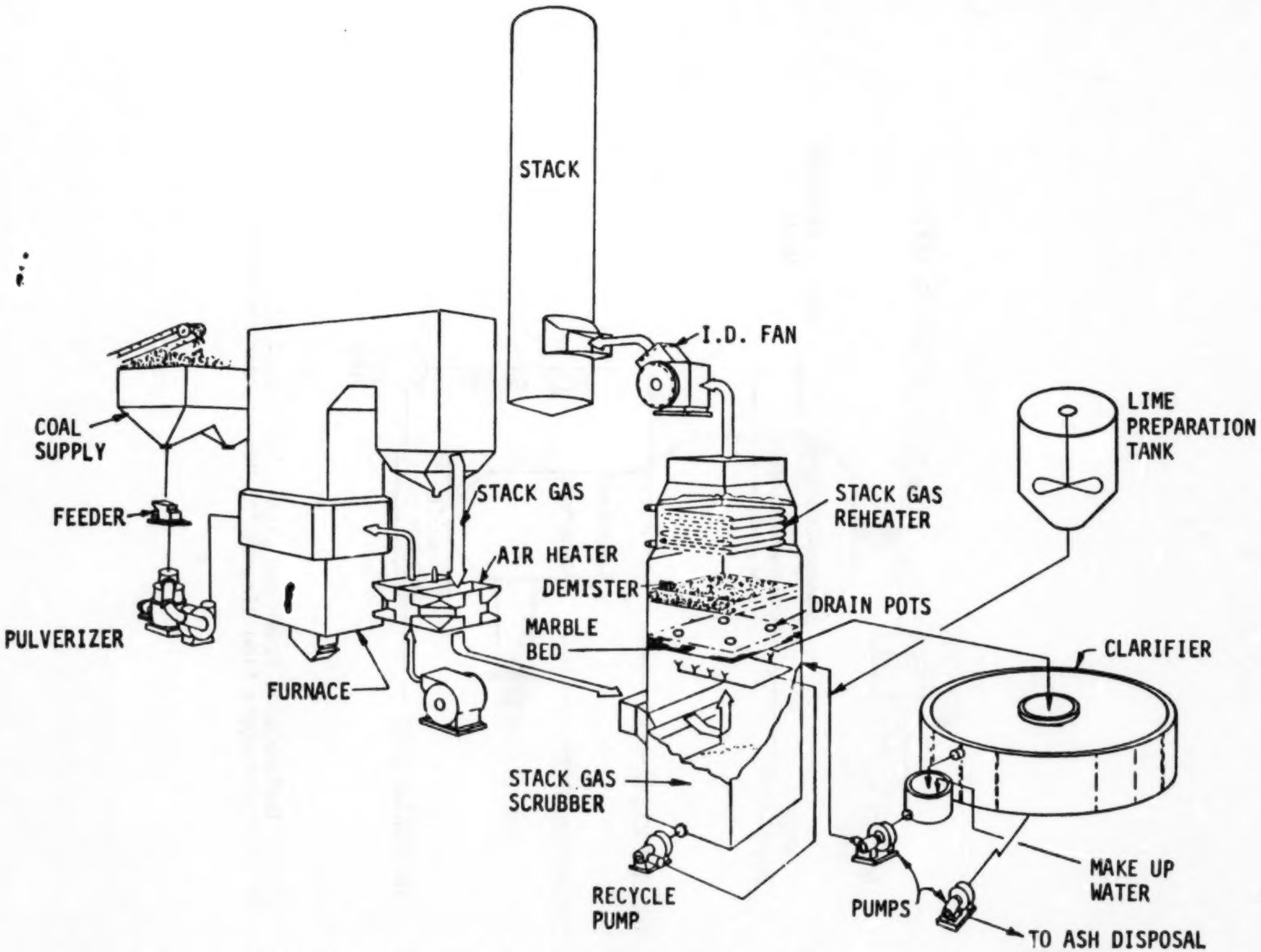
Duquesne Light, F. R. Phillips FGD System:
General Diagram.


STACK
REHEATER
NO. 2 FUEL OIL
COMBUSTION AIR FAN
FLANGED CONNECTION TO CLIENT'S DUCT
VENTURI SCRUBBER
ABSORPTION TOWER
FLUE GAS FROM PLANT
ID FAN
ISOLATION DAMPER
ABSORPTION TOWER RECYCLE PUMP
VENTURI SCRUBBER RECYCLE PUMP
ALTERNATE
ALTERNATE
ADDITIONAL SO2 INJECTION
SODA ASH DUST COLLECTOR
SODA ASH SILO
PNEUMATIC TRUCK COUPLING
SODA ASH VIBRATING HOPPER
SLIDE GATE
SODA ASH WEIGH FEEDER
WATER
SODA ASH TANK & AGITATOR
SODA ASH PUMP
SURGE TANK (EXISTING V-103 & V-102) EPRI SYST.
FROM DISPOSAL POND
EPRI SYSTEM
EPA SYSTEM
EPA SYSTEM MAKE-UP WATER
THICKENER HOLD PUMP
THICKENER HOLD TANK
THICKENER
THICKENER UNDERFLOW PUMP
EPRI SYSTEM
EPA SYSTEM
FILTER CAKE WASH WATER
EPA SYST.
EPRI SYST.
FILTER CAKE CONVEYOR
VACUUM FILTER SYSTEM
FILTRATE PUMP
DUST COLLECTOR
REACTANT SILO (LIMESTONE)
VIBRATION HOPPER
SLIDE GATE
PNEUMATIC TRUCK COUPLING
REACTOR PUMP
WEIGHT FEEDER
WATER
SCREW CONVEYOR
REACTOR NO. 1 AND AGITATOR
REACTOR NO. 2 AND AGITATOR
REACTOR NO. 3 AND AGITATOR
REACTOR NO. 4 AND AGITATOR
REACTOR NO. 5 AND AGITATOR

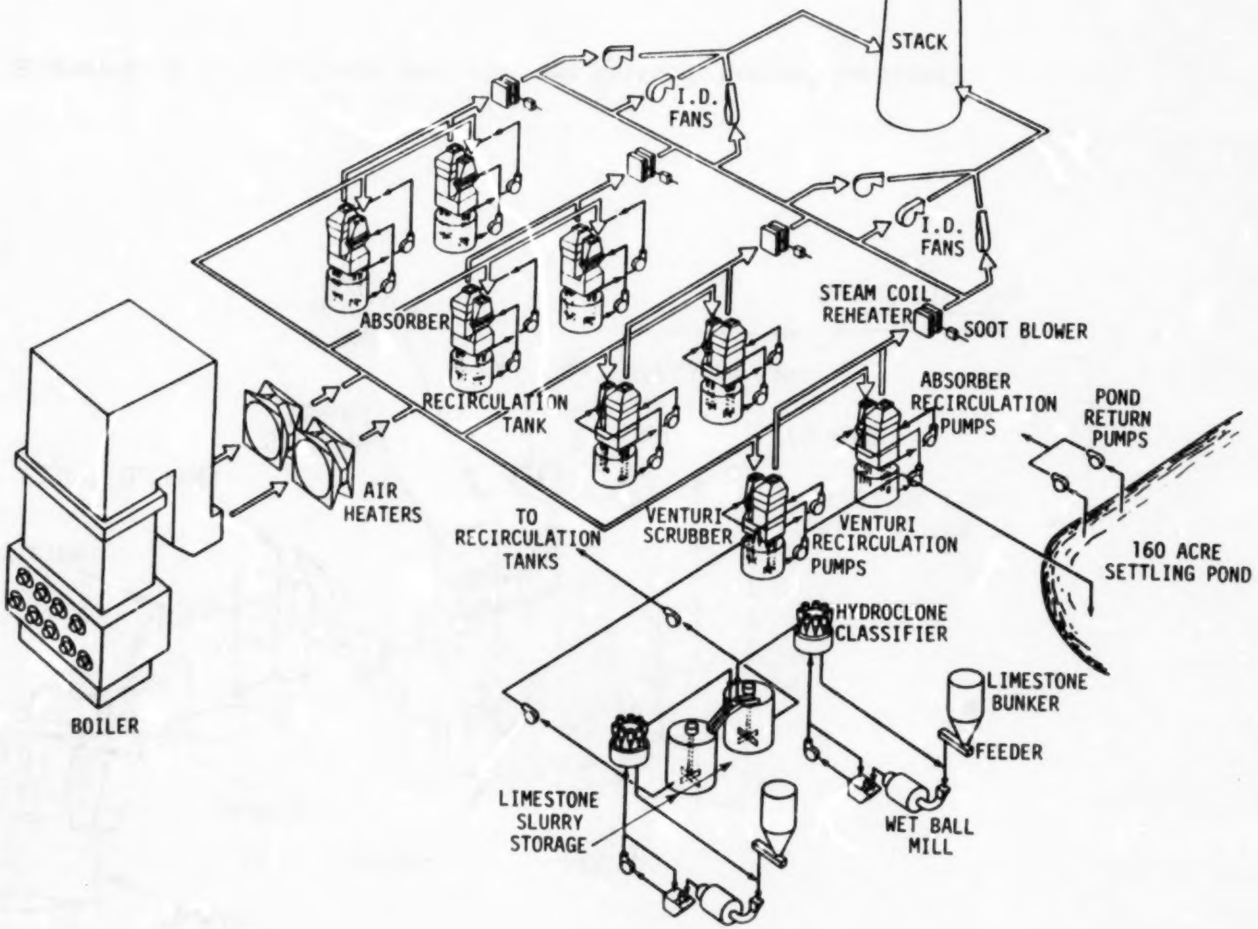
Gulf Power, Scholz 1:
Simplified Process Flow Diagram of the Demonstration
Soda Ash/Limestone Dual Alkali Process


AIR HEATER
CLEAN GAS OUT TO STACK
AMBIENT AIR
FAN
MIST ELIMINATOR WASH
MIST ELIMINATOR
MOBILE PACKING
PRE-SATURATION SPRAY
FLUE GAS IN
SLURRY FEED
WASTE SLURRY TANK
TO STORAGE AREA
PUMP

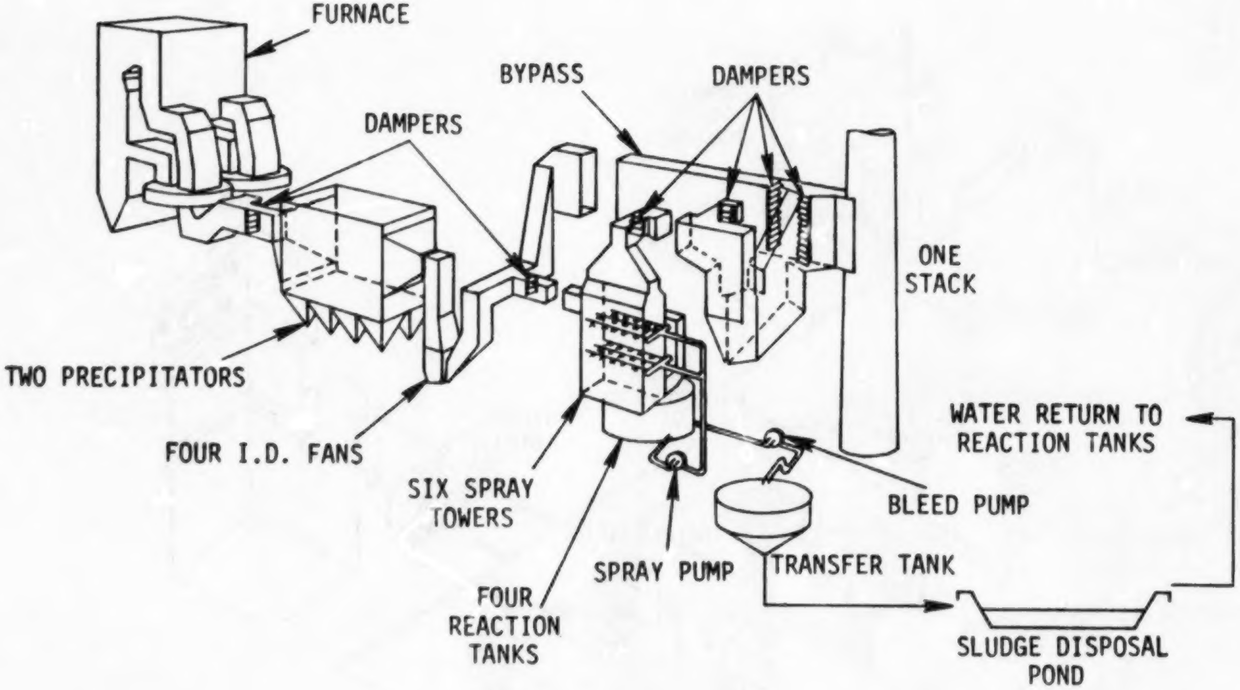
Indianapolis Power and Light, Petersburg 3:
Simplified Process Flow Diagram for One of Four Absorbers


STACK
I.D. FAN
COAL SUPPLY
LIME PREPARATION TANK
STACK GAS
STACK GAS REHEATER
FEEDER
AIR HEATER
DEMISTER
DRAIN POTS
MARBLE BED
CLARIFIER
PULVERIZER
FURNACE
STACK GAS SCRUBBER
MAKE UP WATER
RECYCLE PUMP
PUMPS
TO ASH DISPOSAL POND

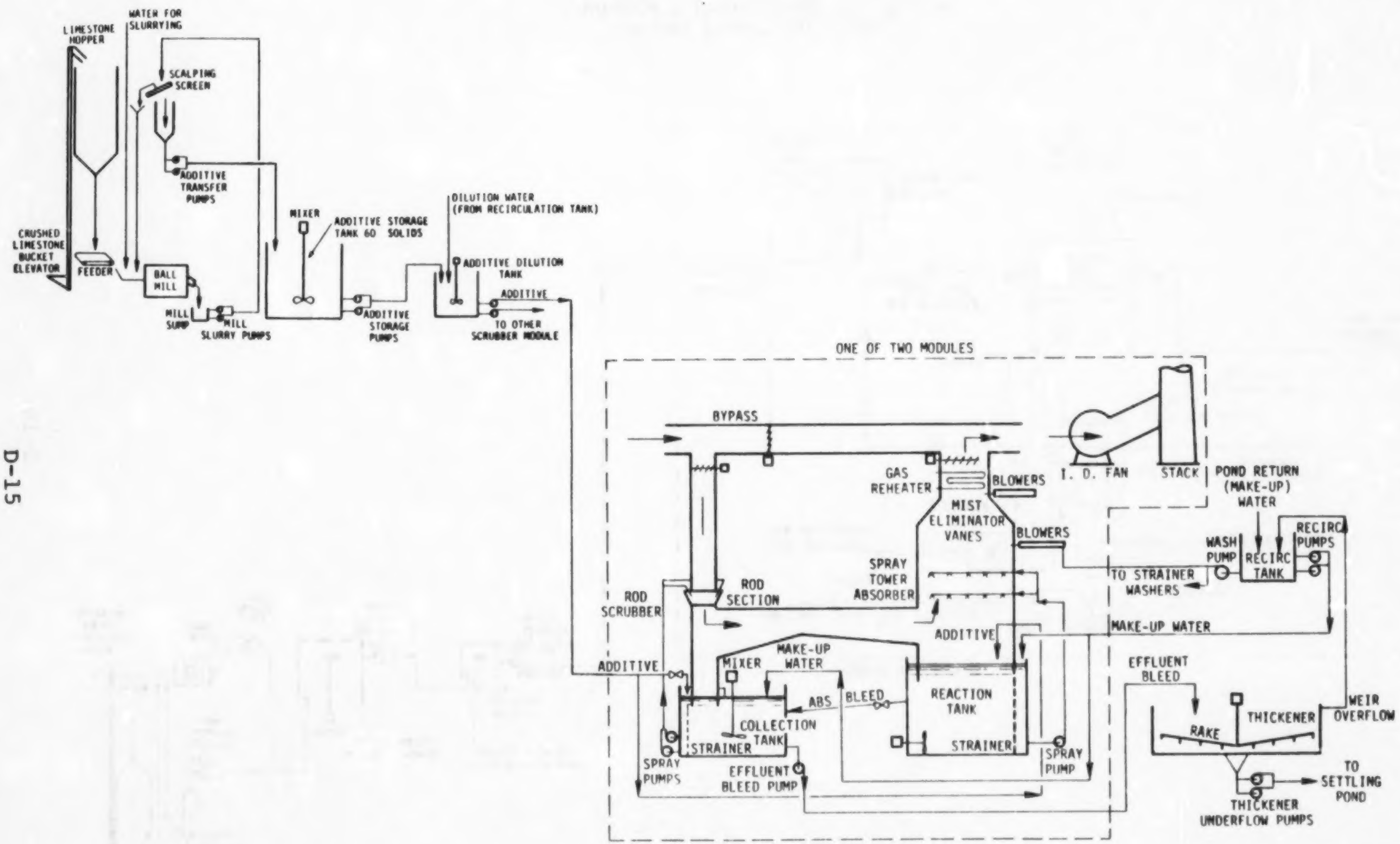
Kansas City Power and Light, Hawthorn Units 3 and 4:
Simplified Process Flow Diagram of the Lime Scrubbing Process


STACK
I.D. FANS
I.D. FANS
STEAM COIL REHEATER
SOOT BLOWER
ABSORBER
RECIRCULATION TANK
BOILER
AIR HEATERS
ABSORBER RECIRCULATION PUMPS
POND RETURN PUMPS
160 ACRE SETTLING POND
TO RECIRCULATION TANKS
VENTURI SCRUBBER
VENTURI RECIRCULATION PUMPS
HYDROCLONE CLASSIFIER
LIMESTONE BUNKER
FEEDER
WET BALL MILL
LIMESTONE SLURRY STORAGE

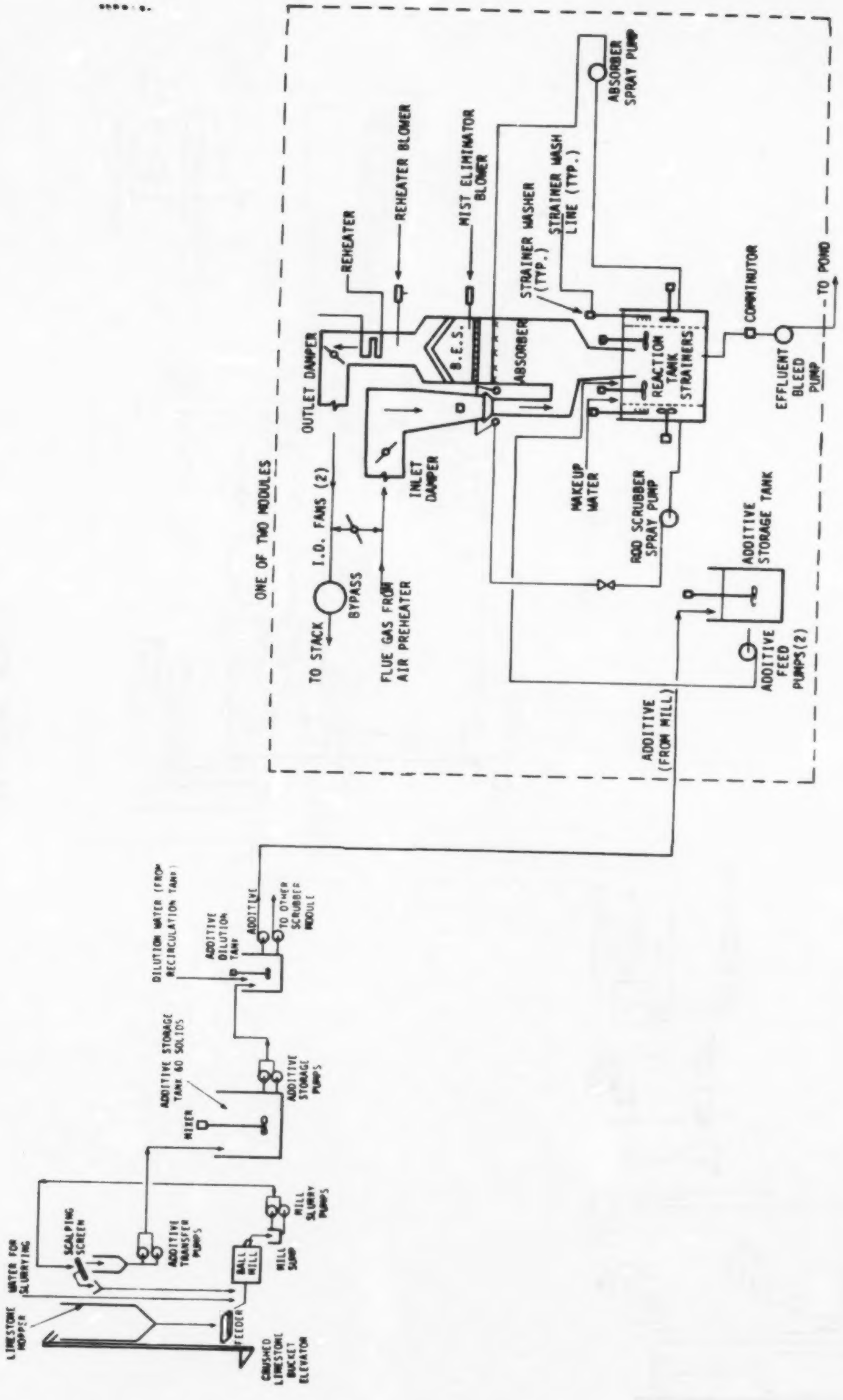
Kansas City Power and Light,
LaCygne 1 FGD System: General Diagram


FURNACE
DAMPERS
BYPASS
DAMPERS
ONE STACK
TWO PRECIPITATORS
FOUR I.D. FANS
SIX SPRAY TOWERS
FOUR REACTION TANKS
SPRAY PUMP
TRANSFER TANK
BLEED PUMP
WATER RETURN TO REACTION TANKS
SLUDGE DISPOSAL POND

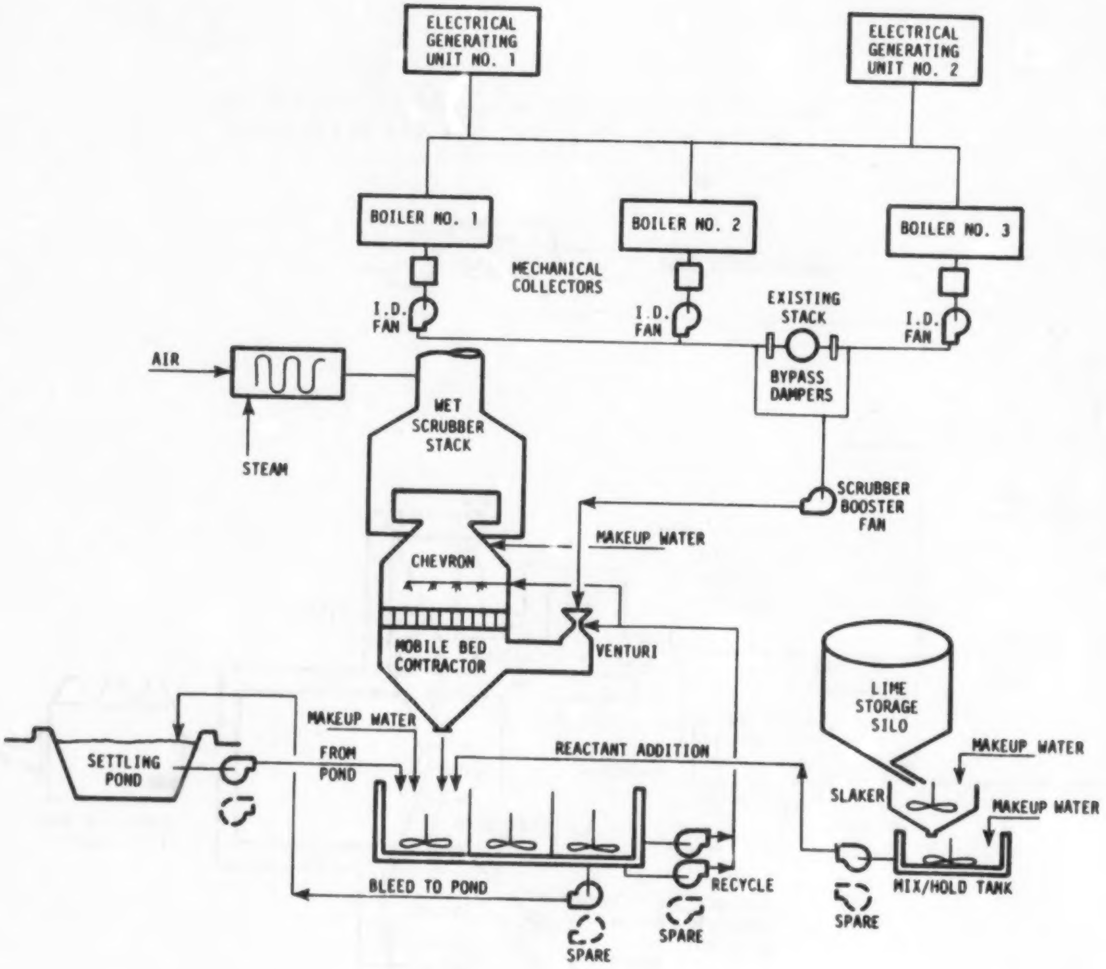
Kansas Power and Light,
Schematic of Jeffrey Steam Generator and Emission Control Equipment


LIMESTONE HOPPER
WATER FOR SLURRYING
SCALPING SCREEN
ADDITIVE TRANSFER PUMPS
CRUSHED LIMESTONE BUCKET ELEVATOR
FEEDER
BALL MILL
MILL SUMP
MILL SLURRY PUMPS
MIXER
ADDITIVE STORAGE TANK 60 SOLIDS
ADDITIVE STORAGE PUMPS
DILUTION WATER (FROM RECIRCULATION TANK)
ADDITIVE DILUTION TANK
ADDITIVE
TO OTHER SCRUBBER MODULE
ONE OF TWO MODULES
BYPASS
GAS REHEATER
BLOWERS
I. D. FAN
STACK
MIST ELIMINATOR VANES
BLOWERS
POND RETURN (MAKE-UP) WATER
WASH PUMP
RECIRC TANK
RECIRC PUMPS
TO STRAINER WASHERS
SPRAY TOWER ABSORBER
ROD SECTION
ROD SCRUBBER
ADDITIVE
MAKE-UP WATER
ADDITIVE
MIXER
MAKE-UP WATER
ABS
BLEED
REACTION TANK
COLLECTION TANK
STRAINER
STRAINER
SPRAY PUMPS
EFFLUENT BLEED PUMP
SPRAY PUMP
EFFLUENT BLEED
RAKE
THICKENER
WEIR OVERFLOW
TO SETTLING POND
THICKENER UNDERFLOW PUMPS

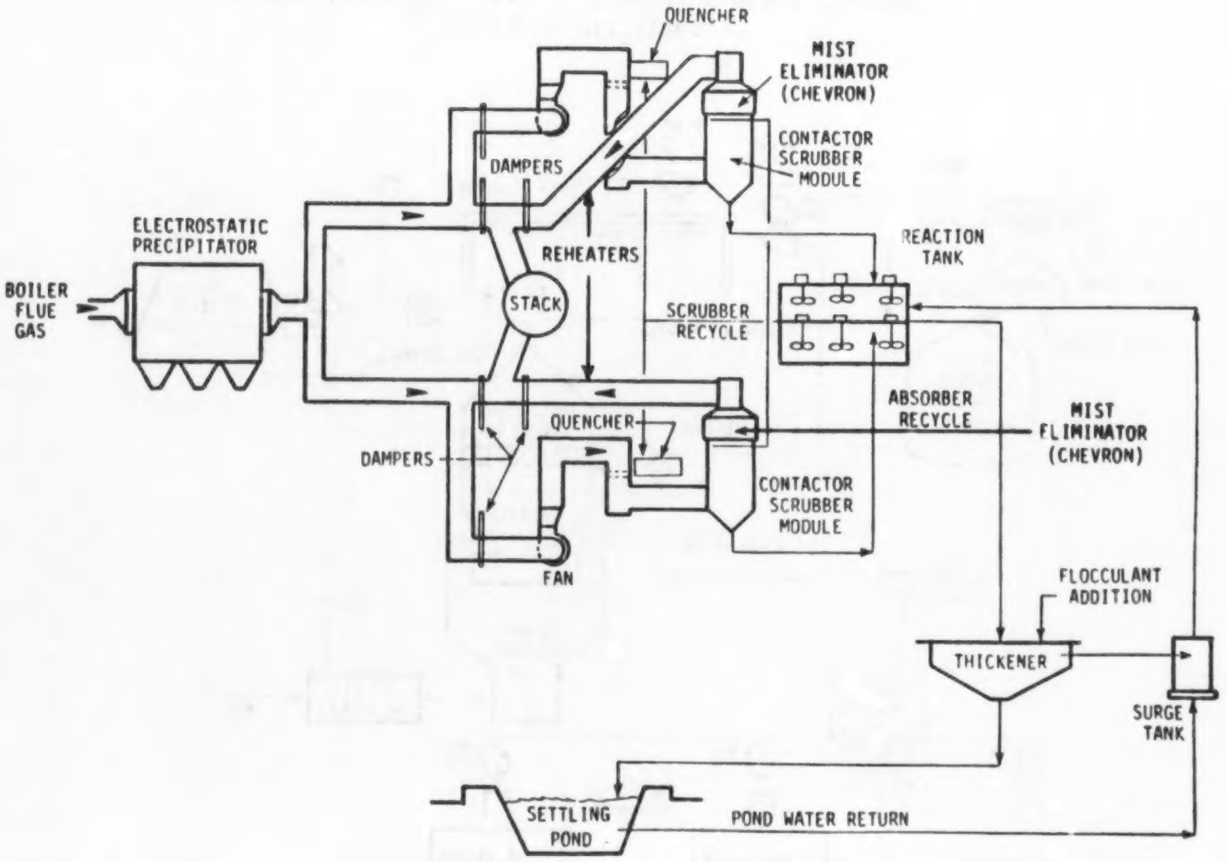
Kansas Power and Light,
Lawrence 4 Operational FGD System:
Simplified Process Flow Diagram


ONE OF TWO MODULES
TO STACK
BYPASS
I.D. FANS (2)
FLUE GAS FROM AIR PREHEATER
OUTLET DAMPER
INLET DAMPER
REHEATER
REHEATER BLOWER
MIST ELIMINATOR BLOWER
B.E.S.
ABSORBER
STRAINER WASHER (TYP.)
STRAINER WASH LINE (TYP.)
ABSORBER SPRAY PUMP
REACTION TANK
STRAINERS
COMMINUTOR
EFFLUENT BLEED PUMP
TO POND
MAKEUP WATER
RGD SCRUBBER SPRAY PUMP
ADDITIVE STORAGE TANK
ADDITIVE FEED PUMPS(2)
ADDITIVE (FROM MILL)
LIMESTONE HOPPER
WATER FOR SLURRYING
SCALPING SCREEN
ADDITIVE TRANSFER PUMPS
BALL MILL
MILL SUMP
MILL SLURRY PUMPS
FEEDER
CRUSHED LIMESTONE BUCKET ELEVATOR
MIXER
ADDITIVE STORAGE TANK 60 SOLIDS
ADDITIVE STORAGE PUMPS
DILUTION WATER (FROM RECIRCULATION TANK)
ADDITIVE DILUTION TANK
ADDITIVE
TO OTHER SCRUBBER MODULE

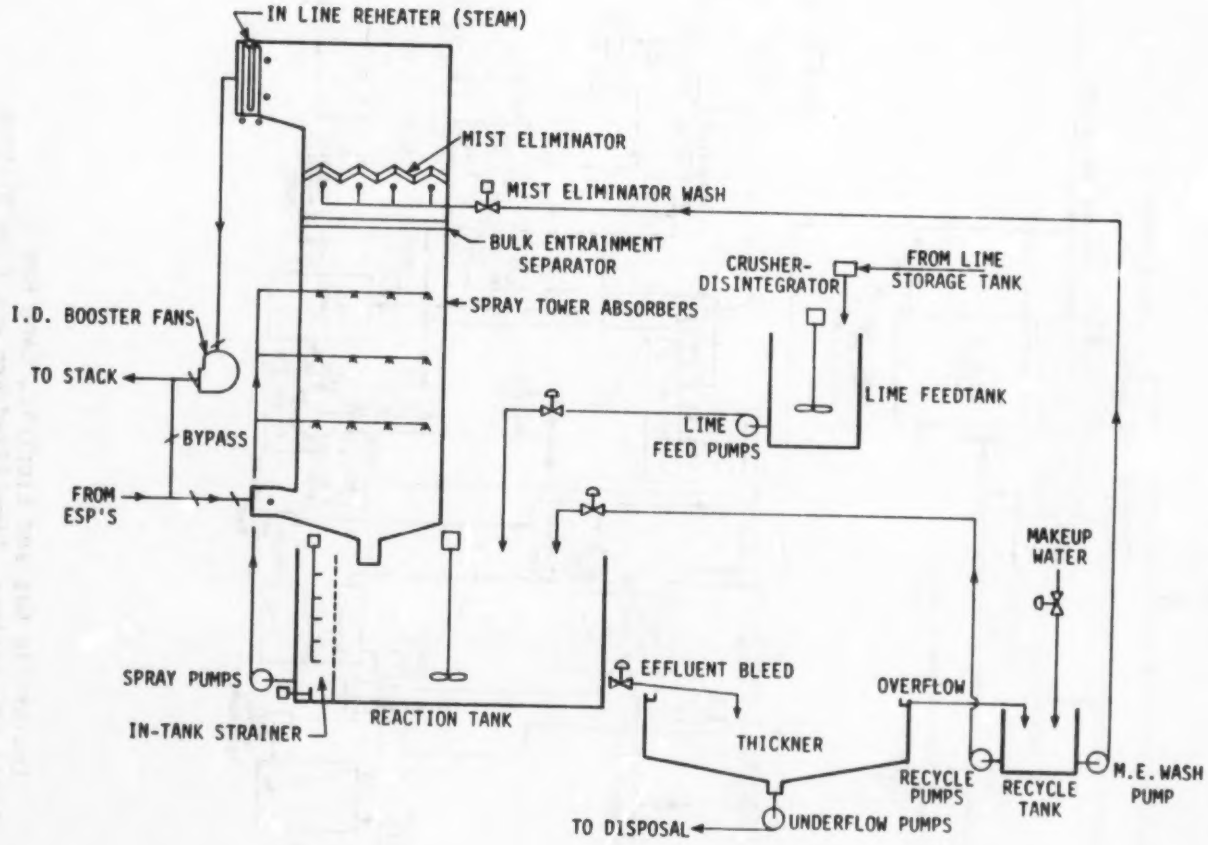
Kansas Power and Light,
Lawrence 5 Operational FGD System:
Simplified Process Flow Diagram


ELECTRICAL GENERATING UNIT NO. 1
ELECTRICAL GENERATING UNIT NO. 2
BOILER NO. 1
BOILER NO. 2
BOILER NO. 3
MECHANICAL COLLECTORS
I.D. FAN
I.D. FAN
EXISTING STACK
I.D. FAN
AIR
BYPASS DAMPERS
WET SCRUBBER STACK
STEAM
SCRUBBER BOOSTER FAN
MAKEUP WATER
CHEVRON
MOBILE BED CONTRACTOR
VENTURI
LIME STORAGE SILO
MAKEUP WATER
SETTLING POND
FROM POND
REACTANT ADDITION
MAKEUP WATER
SLAKER
MAKEUP WATER
BLEED TO POND
RECYCLE
MIX/HOLD TANK
SPARE
SPARE
SPARE

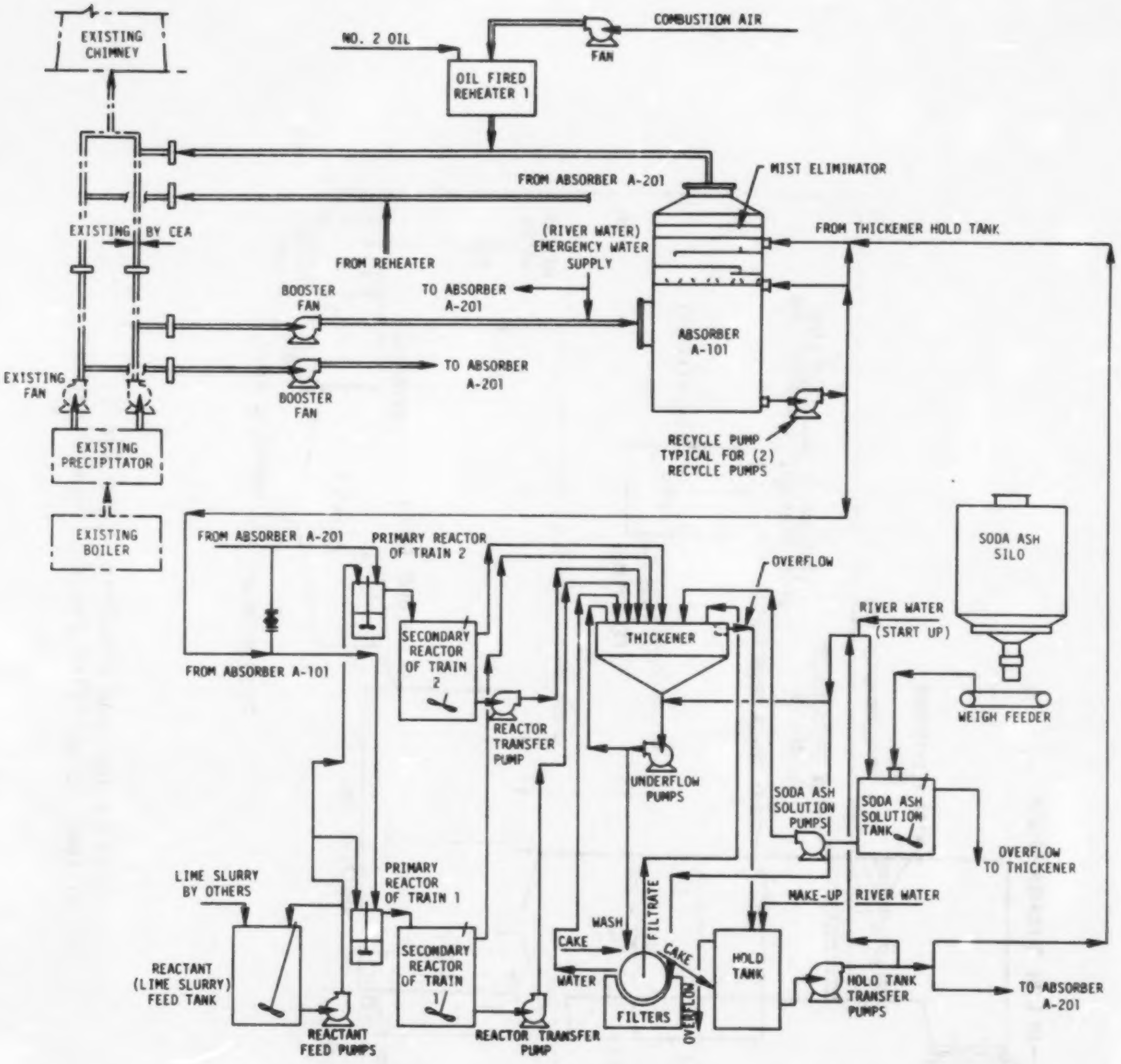
Kentucky Utilities,
Green River FGD System: General Process Diagram


QUENCHER
MIST ELIMINATOR (CHEVRON)
CONTACTOR SCRUBBER MODULE
DAMPERS
ELECTROSTATIC PRECIPITATOR
REHEATERS
REACTION TANK
BOILER FLUE GAS
STACK
SCRUBBER RECYCLE
ABSORBER RECYCLE
MIST FLIMINATOR (CHEVRON)
QUENCHER
DAMPERS
CONTACTOR SCRUBBER MODULE
FAN
FLOCCULANT ADDITION
THICKENER
SURGE TANK
SETTLING POND
POND WATER RETURN

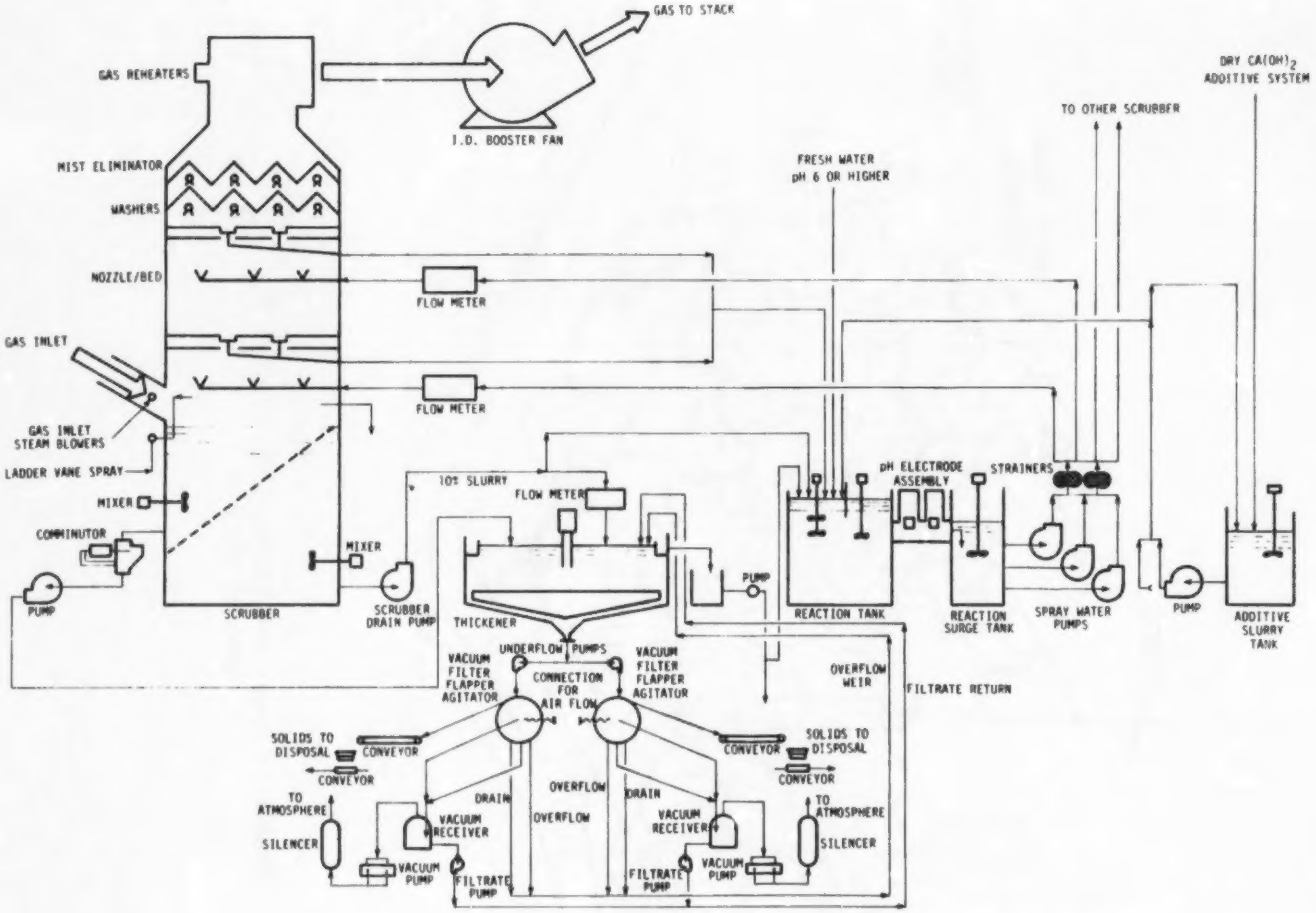
Louisville Gas and Electric, Cane Run 4
FGD System: Simplified Process Flow Diagram


IN LINE REHEATER (STEAM)
MIST ELIMINATOR
MIST ELIMINATOR WASH
BULK ENTRAINMENT SEPARATOR
CRUSHER-DISINTEGRATOR
FROM LIME STORAGE TANK
I.D. BOOSTER FANS
SPRAY TOWER ABSORBERS
TO STACK
LIME FEEDTANK
LIME FEED PUMPS
BYPASS
FROM ESP'S
MAKEUP WATER
SPRAY PUMPS
EFFLUENT BLEED
OVERFLOW
IN-TANK STRAINER
REACTION TANK
THICKNER
RECYCLE PUMPS
RECYCLE TANK
M.E. WASH PUMP
TO DISPOSAL
UNDERFLOW PUMPS

Louisville Gas and Electric, Cane Run 5
FGD System: Simplified Process Flow Diagram

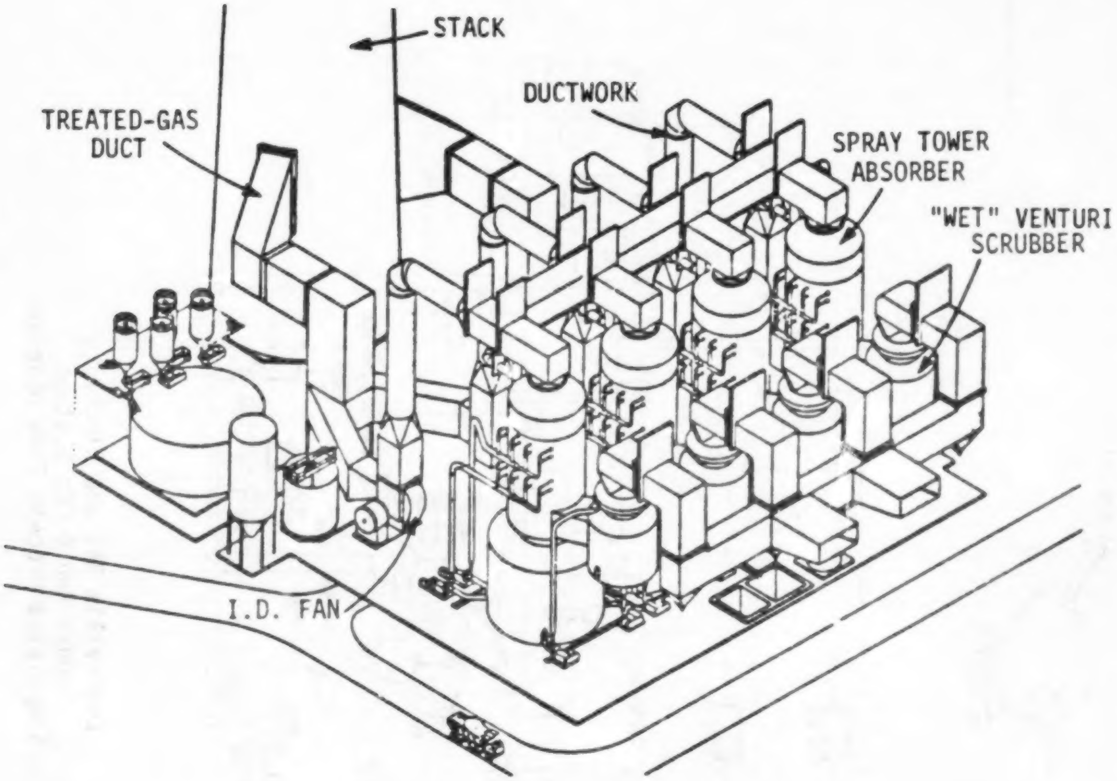

EXISTING CHIMNEY
NO. 2 OIL
OIL FIRED REHEATER 1
COMBUSTION AIR
FAN
FROM ABSORBER A-201
MIST ELIMINATOR
EXISTING
BY CEA
FROM REHEATER
(RIVER WATER) EMERGENCY WATER SUPPLY
FROM THICKENER HOLD TANK
BOOSTER FAN
TO ABSORBER A-201
ABSORBER A-101
TO ABSORBER A-201
EXISTING FAN
BOOSTER FAN
RECYCLE PUMP TYPICAL FOR (2) RECYCLE PUMPS
EXISTING PRECIPITATOR
EXISTING BOILER
FROM ABSORBER A-201
PRIMARY REACTOR OF TRAIN 2
OVERFLOW
SODA ASH SILO
SECONDARY REACTOR OF TRAIN 2
THICKENER
RIVER WATER (START UP)
FROM ABSORBER A-101
REACTOR TRANSFER PUMP
WEIGH FEEDER
UNDERFLOW PUMPS
SODA ASH SOLUTION PUMPS
SODA ASH SOLUTION TANK
OVERFLOW TO THICKENER
LIME SLURRY BY OTHERS
PRIMARY REACTOR OF TRAIN 1
FILTRATE
MAKE-UP RIVER WATER
WASH
CAKE
SECONDARY REACTOR OF TRAIN 1
CAKE
HOLD TANK
REACTANT (LIME SLURRY) FEED TANK
WATER
FILTERS
OVERFLOW
HOLD TANK TRANSFER PUMPS
TO ABSORBER A-201
REACTANT FEED PUMPS
REACTOR TRANSFER PUMP

Louisville Gas and Electric, Cane Run 6
Dual Alkali FGD System: Simplified Process Flow Diagram

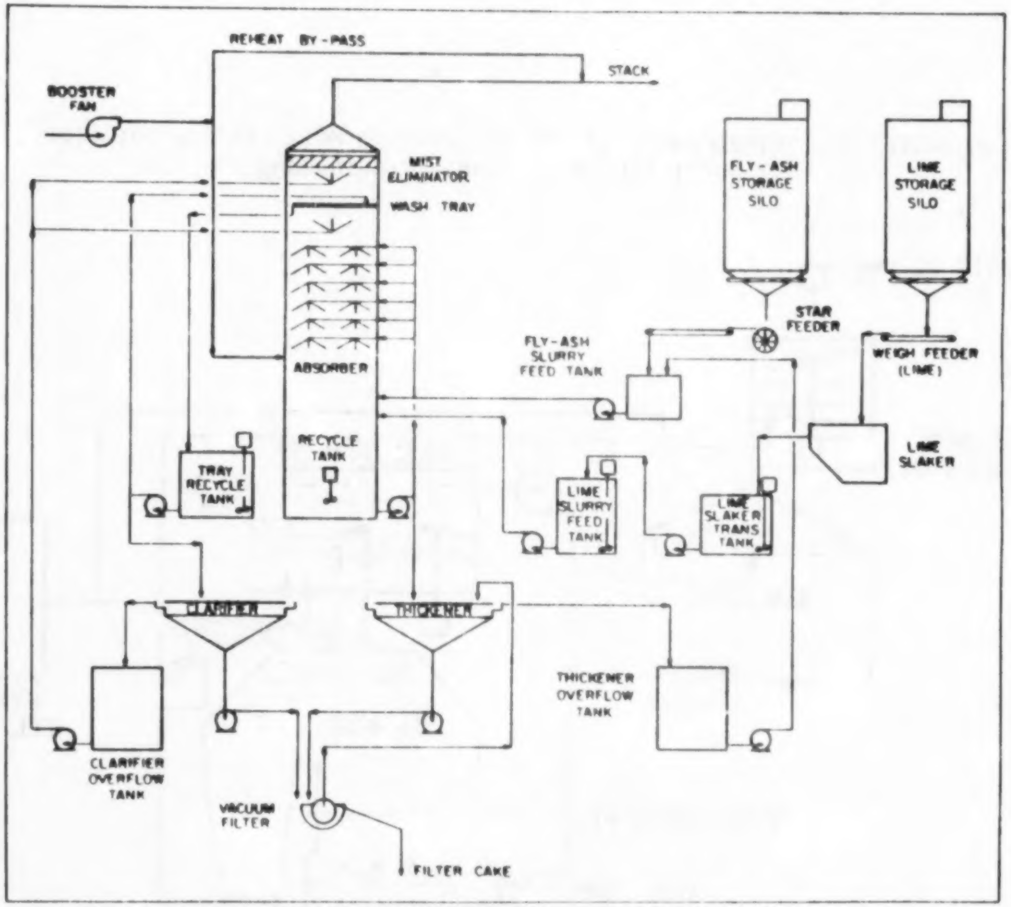


GAS TO STACK
GAS REHEATERS
I.D. BOOSTER FAN
MIST ELIMINATOR
WASHERS
NOZZLE/BED
GAS INLET
GAS INLET STEAM BLOWERS
LADDER VANE SPRAY
MIXER
COMMINUTOR
PUMP
SCRUBBER
MIXER
SCRUBBER DRAIN PUMP
FLOW METER
FLOW METER
10% SLURRY
FLOW METER
THICKENER
PUMP
UNDERFLOW PUMPS
VACUUM FILTER FLAPPER AGITATOR
CONNECTION FOR AIR FLOW
VACUUM FILTER FLAPPER AGITATOR
SOLIDS TO DISPOSAL
CONVEYOR
CONVEYOR
TO ATMOSPHERE
SILENCER
VACUUM RECEIVER
DRAIN
VACUUM PUMP
FILTRATE PUMP
OVERFLOW
OVERFLOW
DRAIN
VACUUM RECEIVER
FILTRATE PUMP
VACUUM PUMP
CONVEYOR
SOLIDS TO DISPOSAL
CONVEYOR
TO ATMOSPHERE
SILENCER
OVERFLOW WEIR
FILTRATE RETURN
FRESH WATER pH 6 OR HIGHER
REACTION TANK
pH ELECTRODE ASSEMBLY
REACTION SURGE TANK
STRAINERS
TO OTHER SCRUBBER
SPRAY WATER PUMPS
PUMP
DRY CA(OH)$_2$ ADDITIVE SYSTEM
ADDITIVE SLURRY TANK

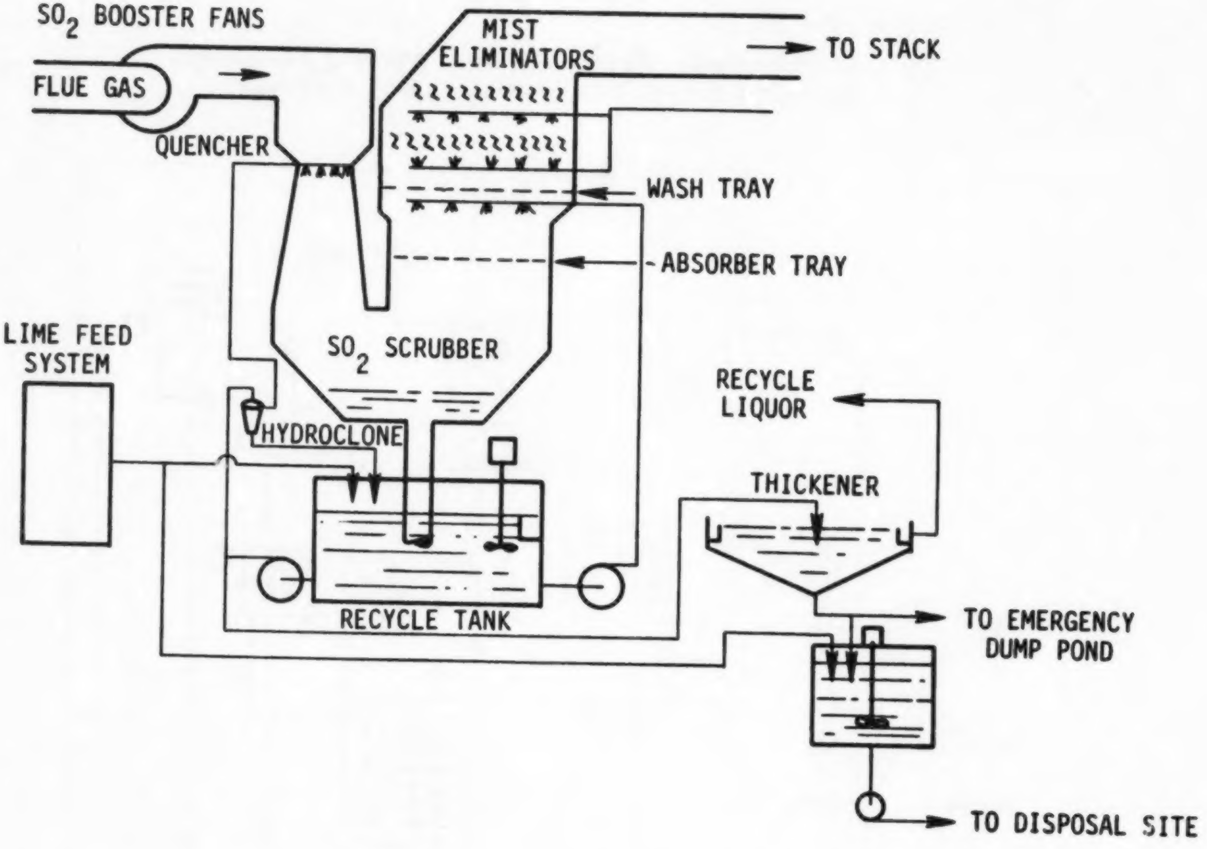
Louisville Gas and Electric,
Paddys Run 6 FGD System:
Simplified Process Flow Diagram


STACK
TREATED-GAS DUCT
DUCTWORK
SPRAY TOWER ABSORBER
"WET" VENTURI SCRUBBER
I.D. FAN

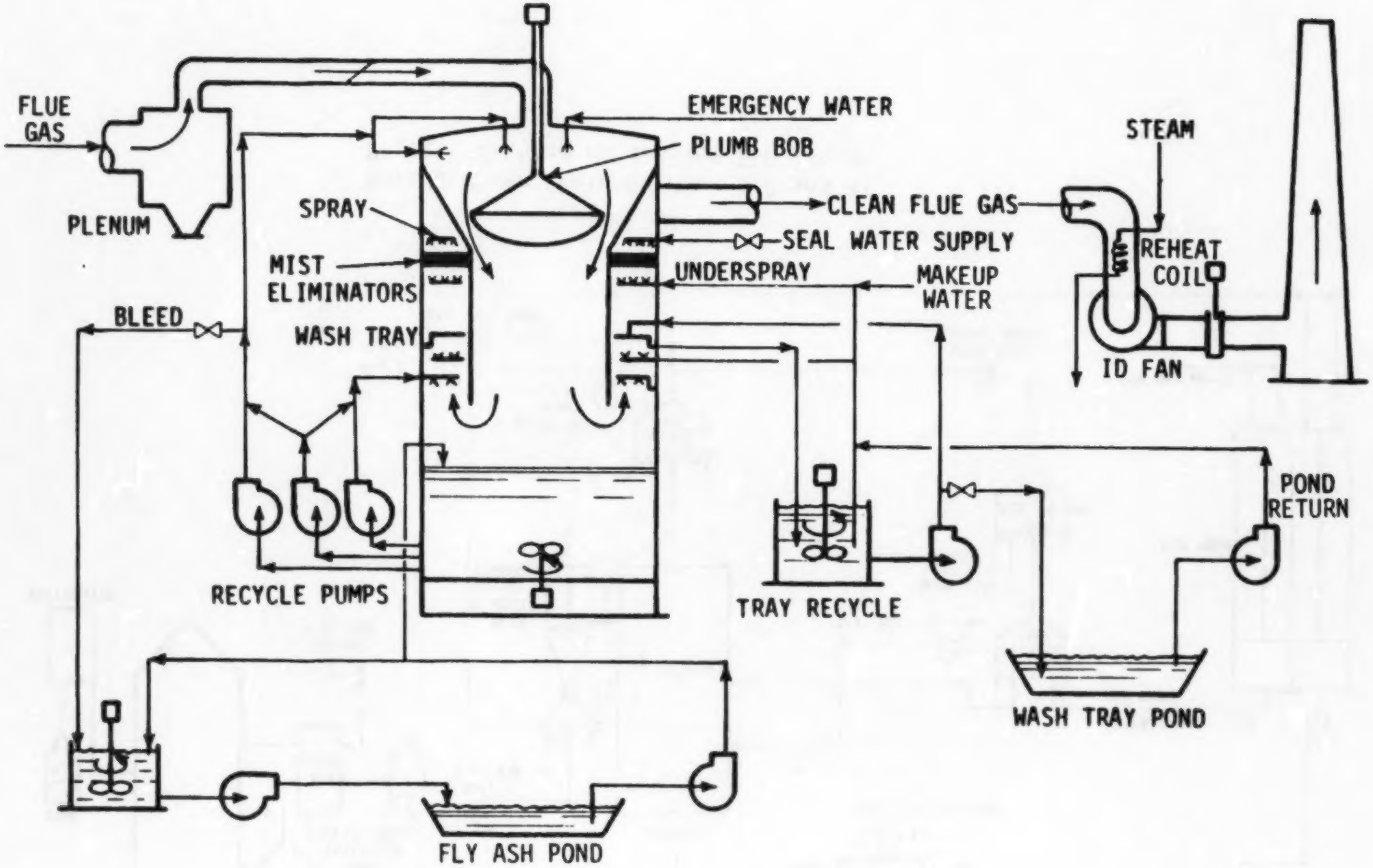
Minnesota Power and Light, Clay Boswell 4:
General Diagram


REHEAT BY-PASS
STACK
BOOSTER FAN
MIST ELIMINATOR
WASH TRAY
FLY-ASH STORAGE SILO
LIME STORAGE SILO
STAR FEEDER
WEIGH FEEDER (LIME)
FLY-ASH SLURRY FEED TANK
ABSORBER
RECYCLE TANK
TRAY RECYCLE TANK
LIME SLAKER
LIME SLURRY FEED TANK
LIME SLAKER TRANS TANK
CLARIFIER
THICKENER
THICKENER OVERFLOW TANK
CLARIFIER OVERFLOW TANK
VACUUM FILTER
FILTER CAKE

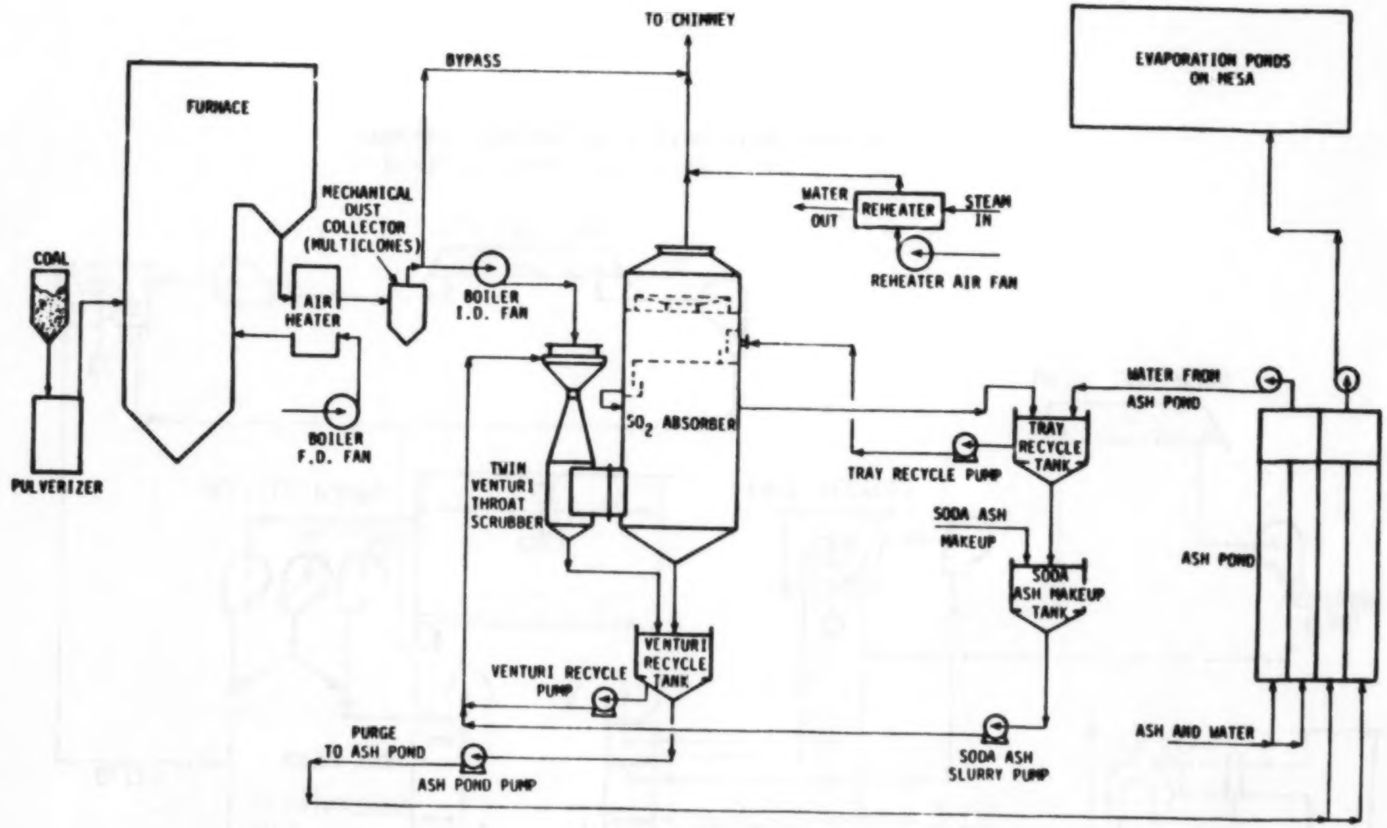
Minnkota Power Cooperative, Milton R. Young 2:
Simplified Process Flow Diagram for One of Two Absorbers


SO_2 BOOSTER FANS
FLUE GAS
QUENCHER
MIST ELIMINATORS
TO STACK
WASH TRAY
ABSORBER TRAY
LIME FEED SYSTEM
SO_2 SCRUBBER
HYDROCLONE
RECYCLE TANK
RECYCLE LIQUOR
THICKENER
TO EMERGENCY DUMP POND
TO DISPOSAL SITE

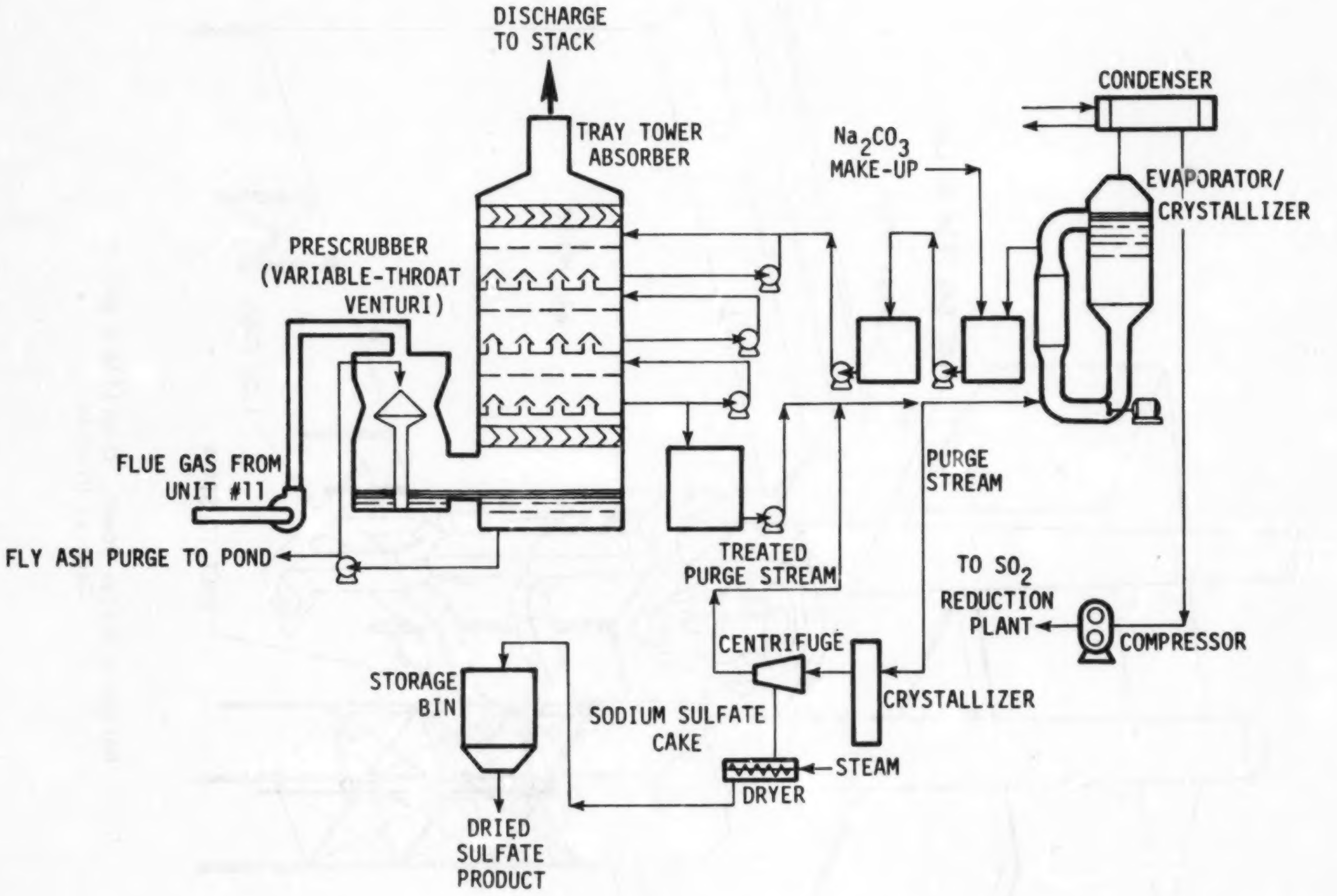
Monongahela Power, Pleasants 1 and 2:
Simplified Process Flow Diagram for One of Four Modules for Either Unit


FLUE GAS
PLENUM
EMERGENCY WATER
PLUMB BOB
SPRAY
MIST ELIMINATORS
WASH TRAY
BLEED
RECYCLE PUMPS
CLEAN FLUE GAS
SEAL WATER SUPPLY
UNDERSPRAY
MAKEUP WATER
STEAM
REHEAT COIL
ID FAN
TRAY RECYCLE
POND RETURN
WASH TRAY POND
FLY ASH POND

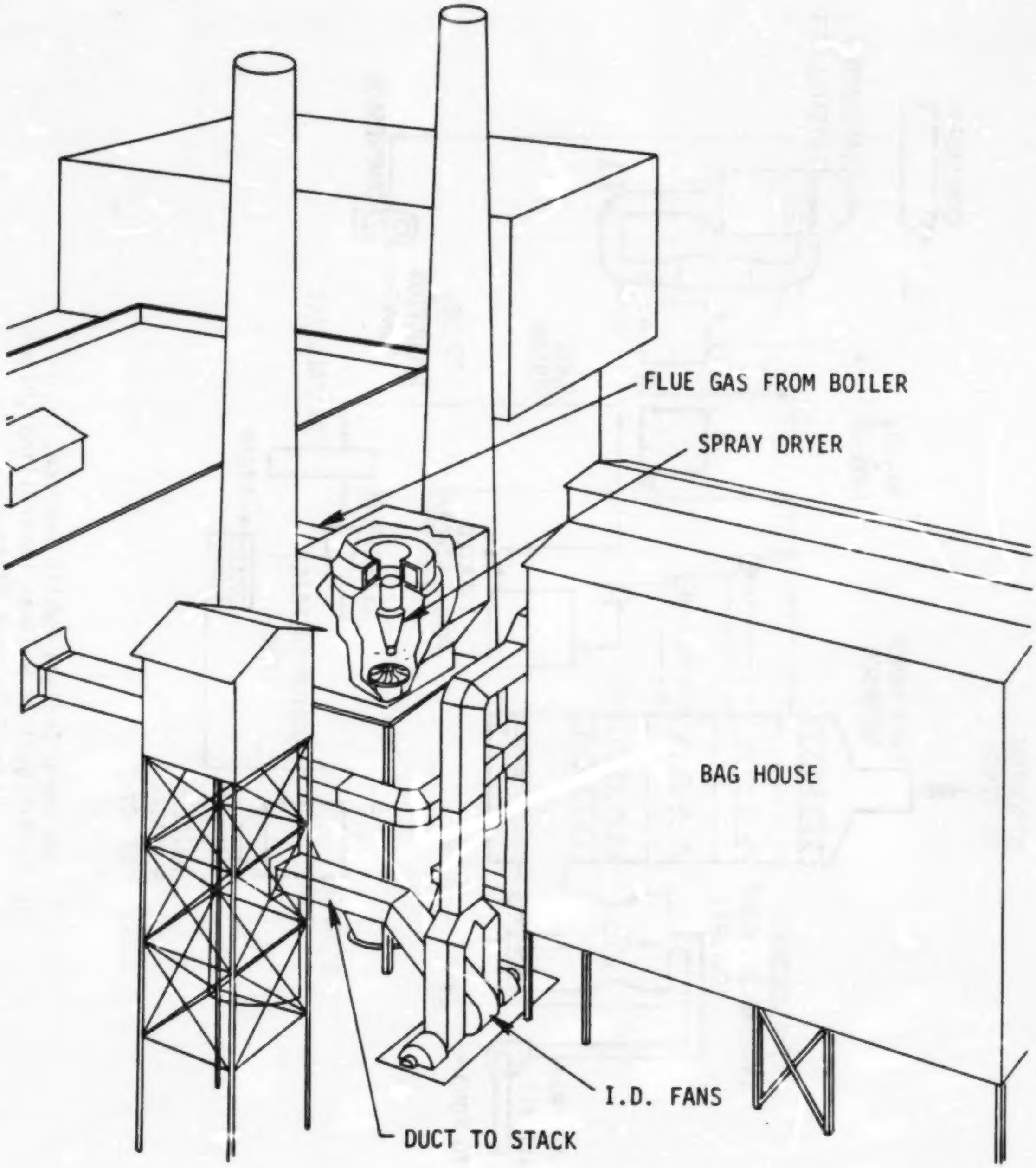
Montana Power, Colstrip 1 and 2:
Process diagram of a given FGD module.


TO CHIMNEY
BYPASS
EVAPORATION PONDS ON MESA
FURNACE
MECHANICAL DUST COLLECTOR (MULTICLONES)
WATER OUT
REHEATER
STEAM IN
REHEATER AIR FAN
COAL
AIR HEATER
BOILER I.D. FAN
BOILER F.D. FAN
PULVERIZER
SO_2 ABSORBER
WATER FROM ASH POND
TRAY RECYCLE TANK
TRAY RECYCLE PUMP
TWIN VENTURI THROAT SCRUBBER
SODA ASH MAKEUP
SODA ASH MAKEUP TANK
ASH POND
VENTURI RECYCLE TANK
VENTURI RECYCLE PUMP
PURGE TO ASH POND
ASH POND PUMP
SODA ASH SLURRY PUMP
ASH AND WATER

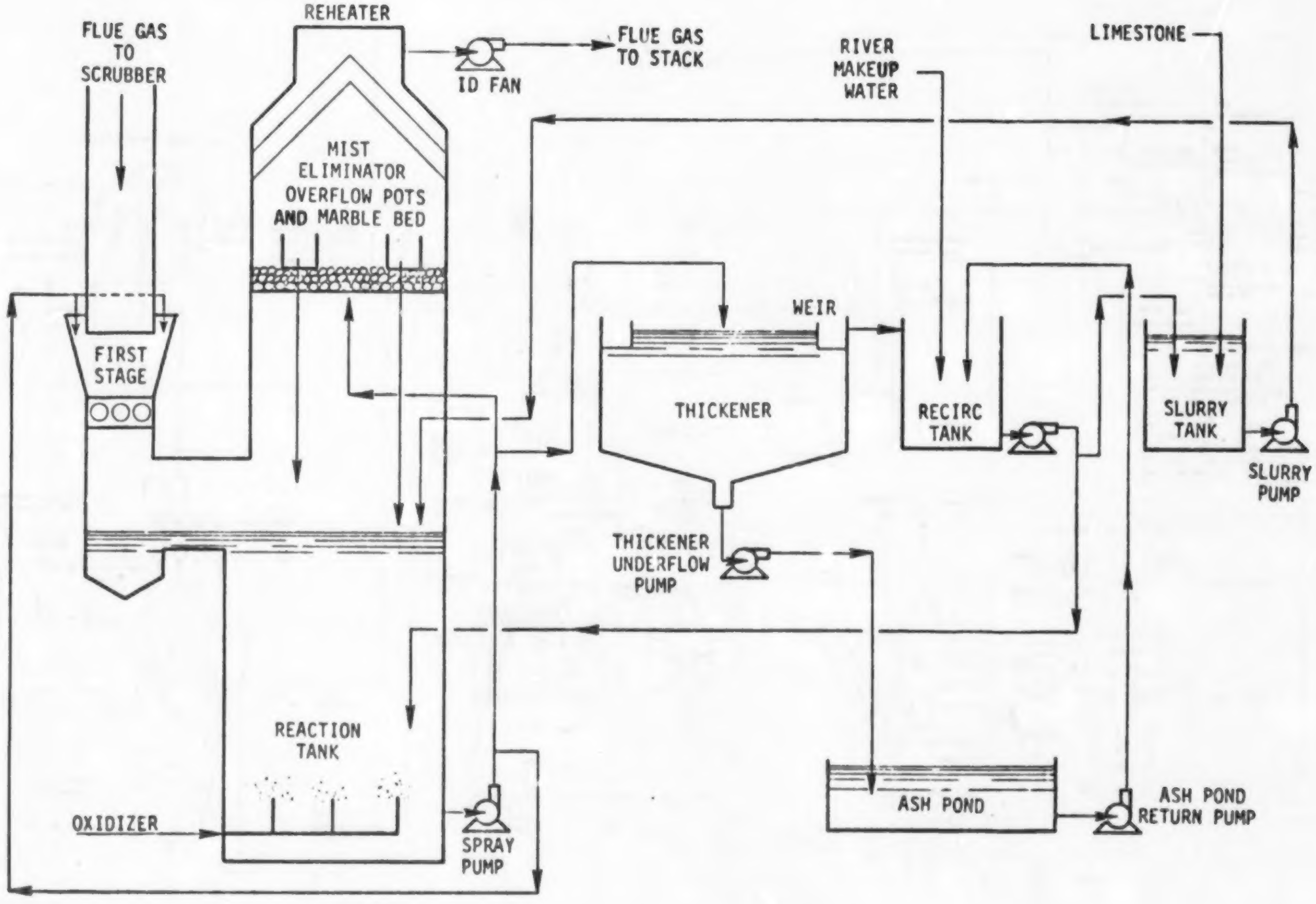
Nevada Power, Reid Gardner 1,2 and 3:
Process diagram of a given FGD system.


DISCHARGE TO STACK
TRAY TOWER ABSORBER
PRESCRUBBER (VARIABLE-THROAT VENTURI)
FLUE GAS FROM UNIT #11
FLY ASH PURGE TO POND
Na_2CO_3 MAKE-UP
CONDENSER
EVAPORATOR/ CRYSTALLIZER
PURGE STREAM
TREATED PURGE STREAM
TO SO_2 REDUCTION PLANT
COMPRESSOR
CENTRIFUGE
CRYSTALLIZER
SODIUM SULFATE CAKE
STEAM
DRYER
STORAGE BIN
DRIED SULFATE PRODUCT

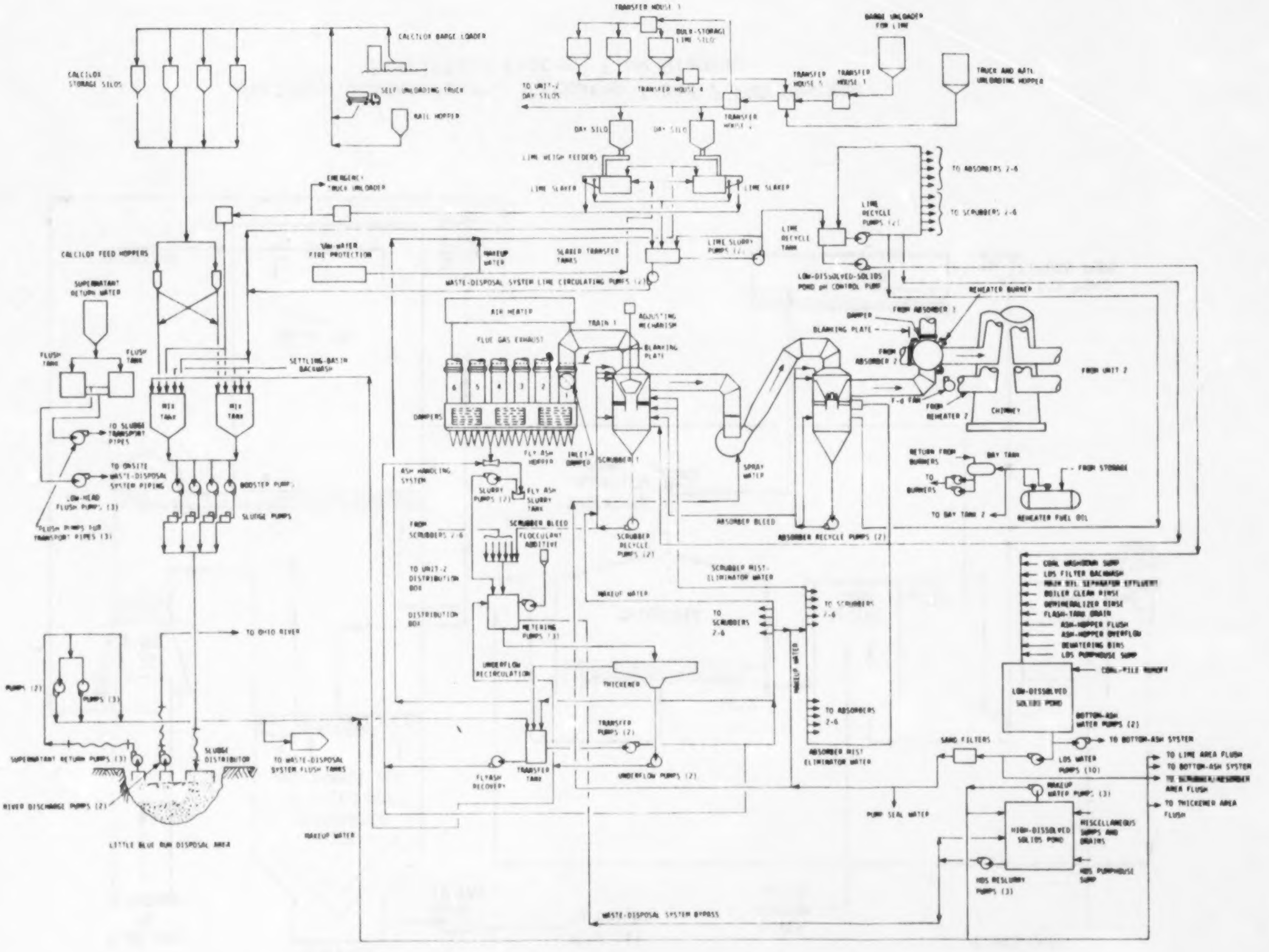
Northern Indiana Public Service,
D. H. Mitchell 11 Wellman Lord/Allied System:
General Process Diagram.


FLUE GAS FROM BOILER
SPRAY DRYER
BAG HOUSE
I.D. FANS
DUCT TO STACK

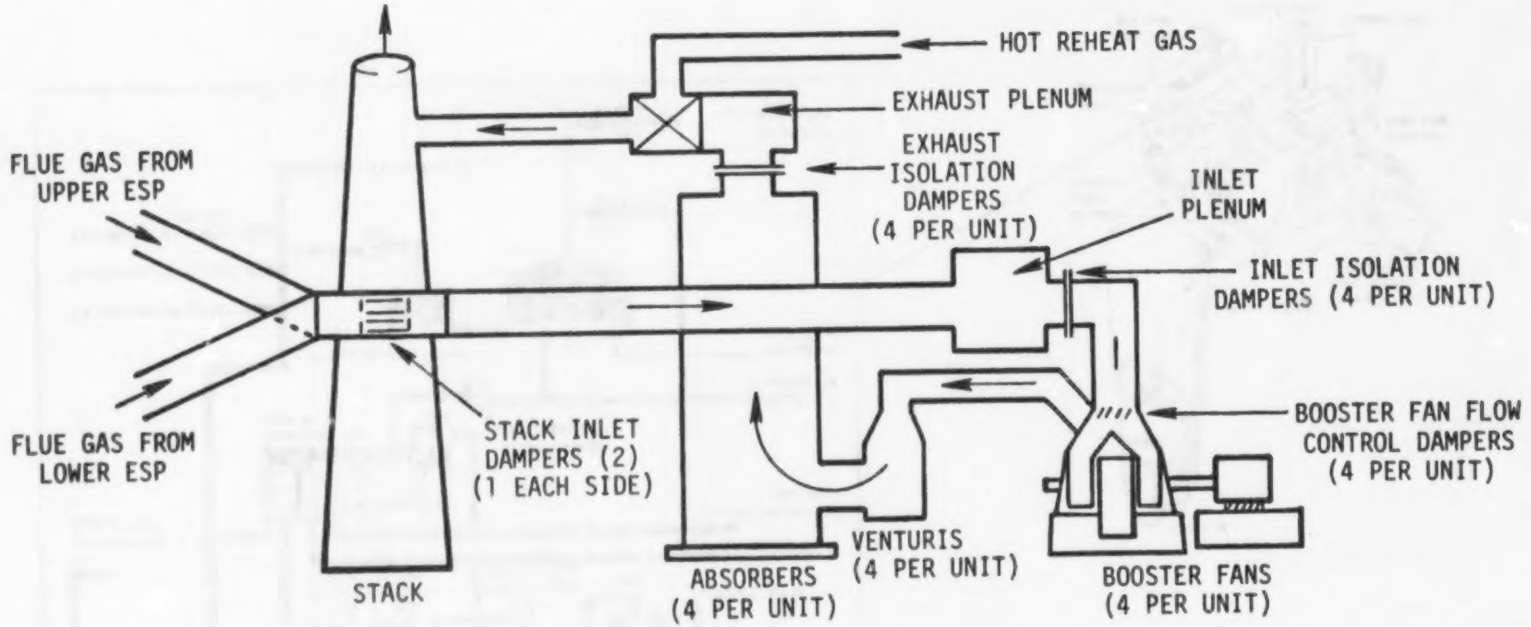
Northern States Power, Riverside 6 and 7:
General Diagram


FLUE GAS
TO
SCRUBBER
REHEATER
ID FAN
FLUE GAS
TO STACK
RIVER
MAKEUP
WATER
LIMESTONE
MIST
ELIMINATOR
OVERFLOW POTS
AND MARBLE BED
FIRST
STAGE
WEIR
THICKENER
RECIRC
TANK
SLURRY
TANK
SLURRY
PUMP
THICKENER
UNDERFLOW
PUMP
REACTION
TANK
OXIDIZER
SPRAY
PUMP
ASH POND
ASH POND
RETURN PUMP

Northern States Power, Sherburne 1 and 2 FGD System:
Simplified Process Flow Diagram

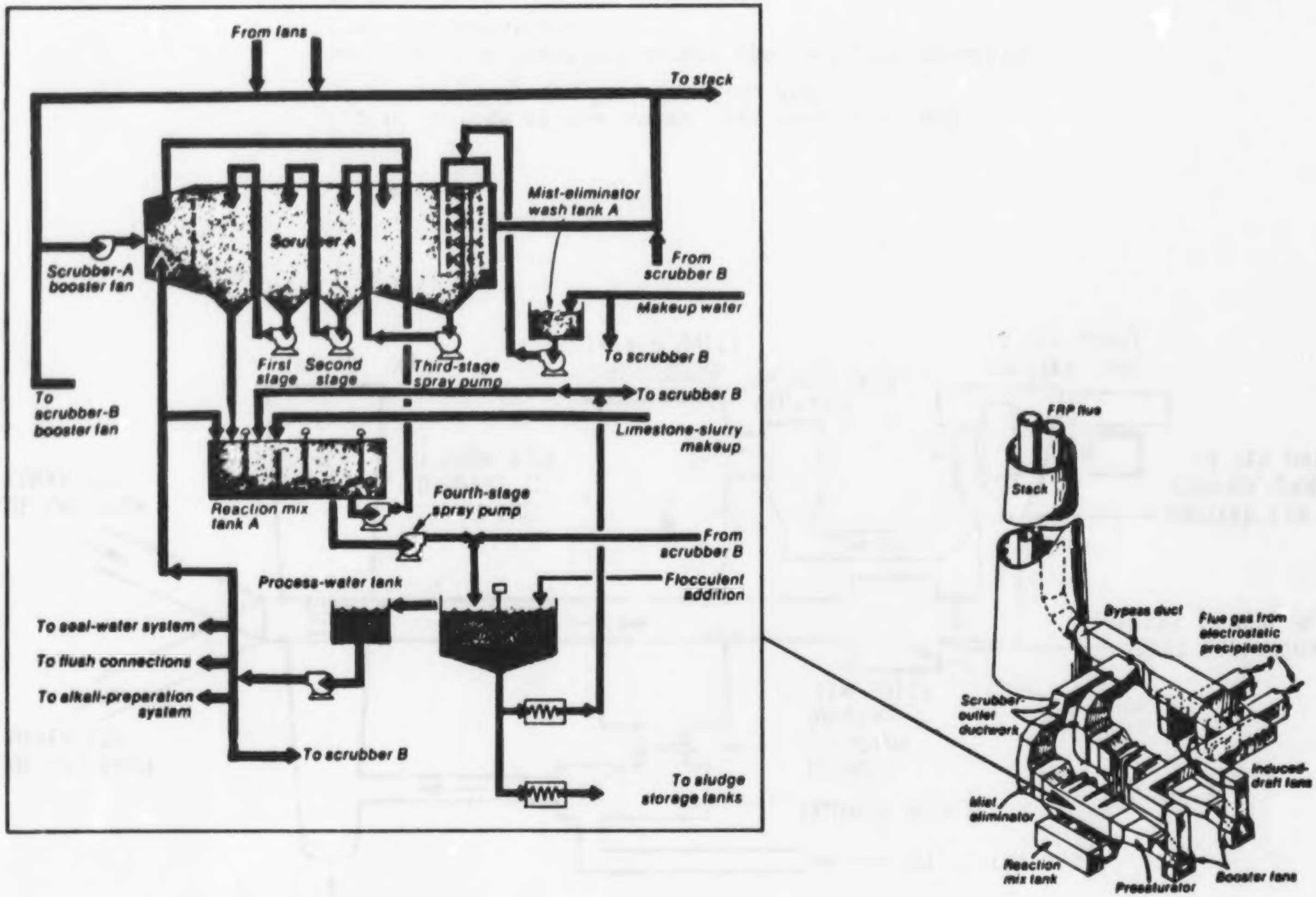

CALCILOX STORAGE SILOS
CALCILOX BARGE LOADER
SELF UNLOADING TRUCK
RAIL HOPPER
TRANSFER HOUSE 3
BULK-STORAGE LIME SILOS
TO UNIT-2 DAY SILOS
TRANSFER HOUSE 4
TRANSFER HOUSE 5
TRANSFER HOUSE 1
TRANSFER HOUSE 2
BARGE UNLOADER FOR LIME
TRUCK AND RAIL UNLOADING HOPPER
DAY SILO
DAY SILO
LIME WEIGH FEEDERS
LIME SLAKER
LIME SLAKER
TO ABSORBERS 2-6
TO SCRUBBERS 2-6
EMERGENCY TRUCK UNLOADER
LIME RECYCLE PUMPS (2)
LIME RECYCLE TANK
LIME SLURRY PUMPS (2)
SLAKER TRANSFER TANKS
MAKEUP WATER
SAW WATER FIRE PROTECTION
WASTE-DISPOSAL SYSTEM LIME CIRCULATING PUMPS (2)
LOW-DISSOLVED-SOLIDS POND pH CONTROL PUMP
CALCILOX FEED HOPPERS
SUPERNATANT RETURN WATER
FLUSH TANK
FLUSH TANK
SETTLING-BASIN BACKWASH
MIX TANK
MIX TANK
TO SLUDGE TRANSPORT PIPES
TO ONSITE WASTE-DISPOSAL SYSTEM PIPING
LOW-HEAD FLUSH PUMPS (3)
FLUSH PUMPS FOR TRANSPORT PIPES (3)
BOOSTER PUMPS
SLUDGE PUMPS
AIR HEATER
FLUE GAS EXHAUST
TRAIN 1
ADJUSTING MECHANISM
BLANKING PLATE
DAMPERS
6
5
4
3
2
1
FLY ASH HOPPER
INLET DAMPER
SCRUBBER 1
SPRAY WATER
REHEATER BURNER
FROM ABSORBER 1
DAMPER
BLANKING PLATE
FROM ABSORBER 2
F-D FAN
FROM REHEATER 2
CHIMNEY
FROM UNIT 2
RETURN FROM BURNERS
DAY TANK
FROM STORAGE
TO BURNERS
TO DAY TANK 2
REHEATER FUEL OIL
ASH HANDLING SYSTEM
SLURRY PUMPS (2)
FLY ASH SLURRY TANK
SCRUBBER BLEED
FROM SCRUBBERS 2-6
FLOCCULANT ADDITIVE
SCRUBBER RECYCLE PUMPS (2)
ABSORBER BLEED
ABSORBER RECYCLE PUMPS (2)
SCRUBBER MIST-ELIMINATOR WATER
MAKEUP WATER
TO SCRUBBERS 2-6
TO SCRUBBERS 2-6
TO UNIT-2 DISTRIBUTION BOX
DISTRIBUTION BOX
METERING PUMPS (3)
UNDERFLOW RECIRCULATION
THICKENER
MAKEUP WATER
TO ABSORBERS 2-6
ABSORBER MIST ELIMINATOR WATER
TO OHIO RIVER
PUMPS (2)
PUMPS (3)
SUPERNATANT RETURN PUMPS (3)
SLUDGE DISTRIBUTOR
TO WASTE-DISPOSAL SYSTEM FLUSH TANKS
RIVER DISCHARGE PUMPS (2)
LITTLE BLUE RUN DISPOSAL AREA
MAKEUP WATER
FLYASH RECOVERY
TRANSFER TANK
TRANSFER PUMPS (2)
UNDERFLOW PUMPS (2)
WASTE-DISPOSAL SYSTEM BYPASS
PUMP SEAL WATER
COAL WASHDOWN SUMP
LDS FILTER BACKWASH
MAIN OIL SEPARATOR EFFLUENT
BOILER CLEAN RINSE
DEMINERALIZER RINSE
FLASH-TANK DRAIN
ASH-HOPPER FLUSH
ASH-HOPPER OVERFLOW
DEWATERING BINS
LDS PUMPHOUSE SUMP
COAL-PILE RUNOFF
LOW-DISSOLVED SOLIDS POND
BOTTOM-ASH WATER PUMPS (2)
TO BOTTOM-ASH SYSTEM
SAND FILTERS
LDS WATER PUMPS (10)
TO LIME AREA FLUSH
TO BOTTOM-ASH SYSTEM
TO SCRUBBER/ABSORBER AREA FLUSH
TO THICKENER AREA FLUSH
MAKEUP WATER PUMPS (3)
HIGH-DISSOLVED SOLIDS POND
MISCELLANEOUS SUMPS AND DRAINS
HDS PUMPHOUSE SUMP
HDS RESLURRY PUMPS (3)

Pennsylvania Power, Bruce Mansfield FGD System:
Process Flow Diagram for Unit 1 or 2

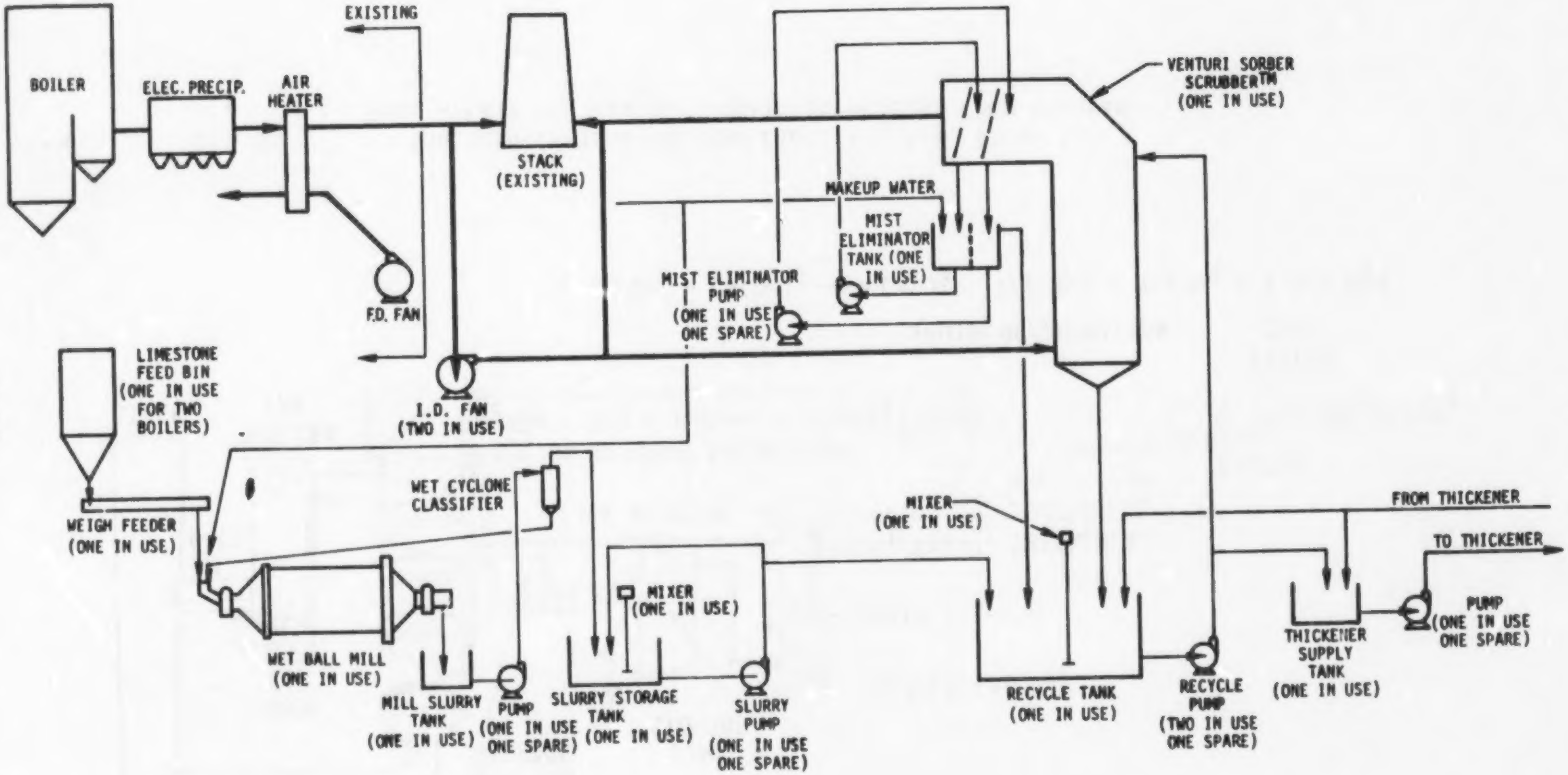

HOT REHEAT GAS
EXHAUST PLENUM
EXHAUST ISOLATION DAMPERS (4 PER UNIT)
INLET PLENUM
INLET ISOLATION DAMPERS (4 PER UNIT)
FLUE GAS FROM UPPER ESP
FLUE GAS FROM LOWER ESP
STACK INLET DAMPERS (2) (1 EACH SIDE)
BOOSTER FAN FLOW CONTROL DAMPERS (4 PER UNIT)
STACK
ABSORBERS (4 PER UNIT)
VENTURIS (4 PER UNIT)
BOOSTER FANS (4 PER UNIT)

Public Service of New Mexico, San Juan 1, 2, and 3*
FGD System Flue Gas Flow Path

*San Juan 3 is identical except that only one scrubbing train is operational.

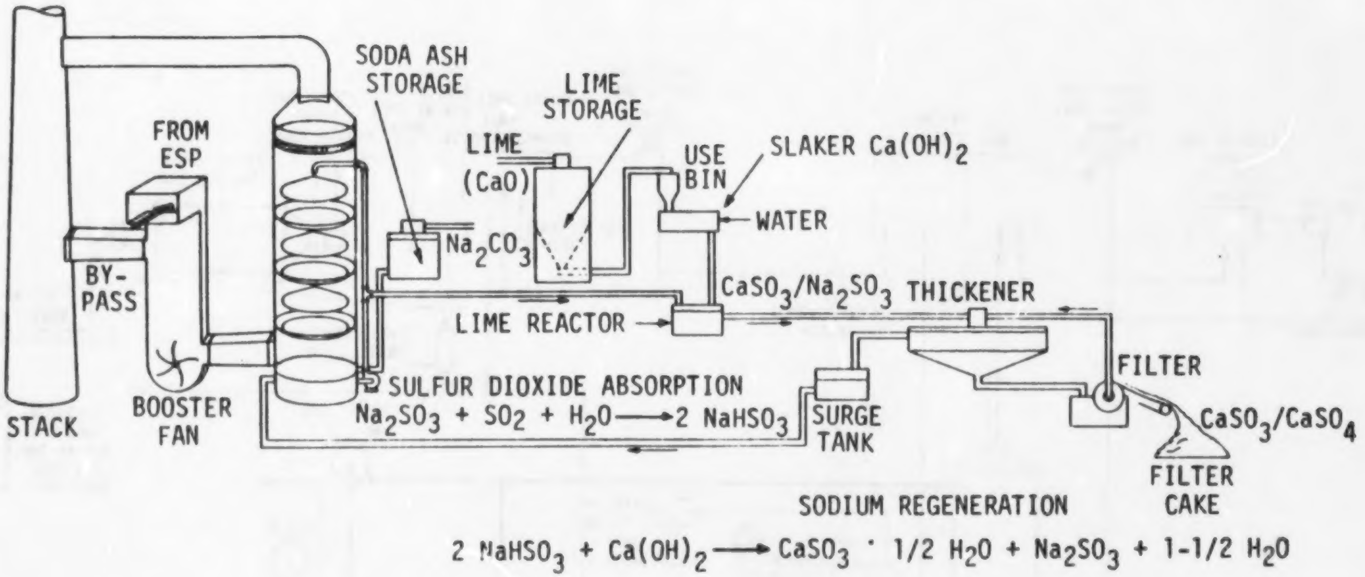

From fans
To stack
Mist-eliminator wash tank A
From scrubber B
Scrubber A
Scrubber-A booster fan
Makeup water
To scrubber B
First stage
Second stage
Third-stage spray pump
To scrubber-B booster fan
To scrubber B
Limestone-slurry makeup
Reaction mix tank A
Fourth-stage spray pump
From scrubber B
Process-water tank
Flocculent addition
To seal-water system
To flush connections
To alkali-preparation system
To scrubber B
To sludge storage tanks
FRP flue
Stack
Bypass duct
Flue gas from electrostatic precipitators
Scrubber-outlet ductwork
Induced-draft fans
Mist eliminator
Reaction mix tank
Pressurator
Booster fans

Salt River Project, Coronado 1 and 2:
Simplified Process Flow Diagram

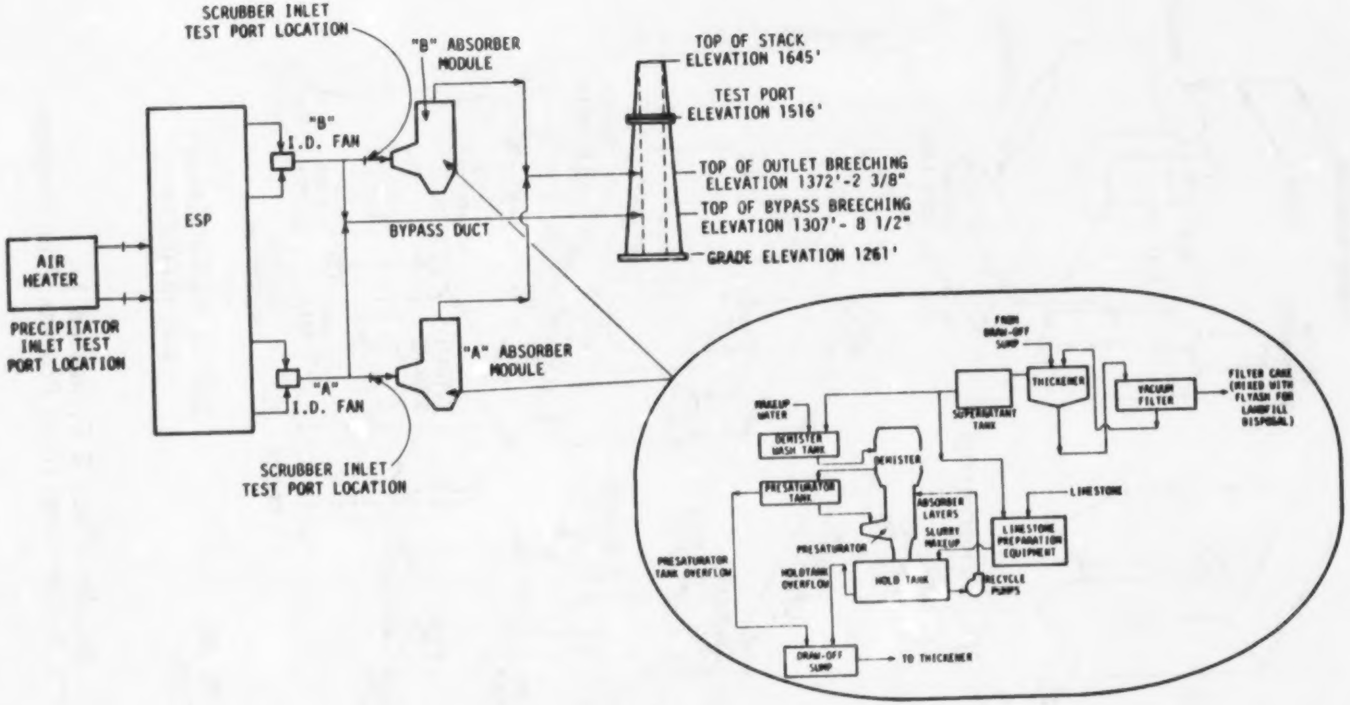


BOILER
ELEC. PRECIP.
AIR HEATER
EXISTING
F.D. FAN
STACK (EXISTING)
I.D. FAN (TWO IN USE)
MAKEUP WATER
MIST ELIMINATOR TANK (ONE IN USE)
MIST ELIMINATOR PUMP (ONE IN USE ONE SPARE)
VENTURI SORBER SCRUBBER™ (ONE IN USE)
LIMESTONE FEED BIN (ONE IN USE FOR TWO BOILERS)
WEIGH FEEDER (ONE IN USE)
WET CYCLONE CLASSIFIER
WET BALL MILL (ONE IN USE)
MILL SLURRY TANK (ONE IN USE)
PUMP (ONE IN USE ONE SPARE)
SLURRY STORAGE TANK (ONE IN USE)
MIXER (ONE IN USE)
SLURRY PUMP (ONE IN USE ONE SPARE)
MIXER (ONE IN USE)
RECYCLE TANK (ONE IN USE)
RECYCLE PUMP (TWO IN USE ONE SPARE)
FROM THICKENER
TO THICKENER
THICKENER SUPPLY TANK (ONE IN USE)
PUMP (ONE IN USE ONE SPARE)

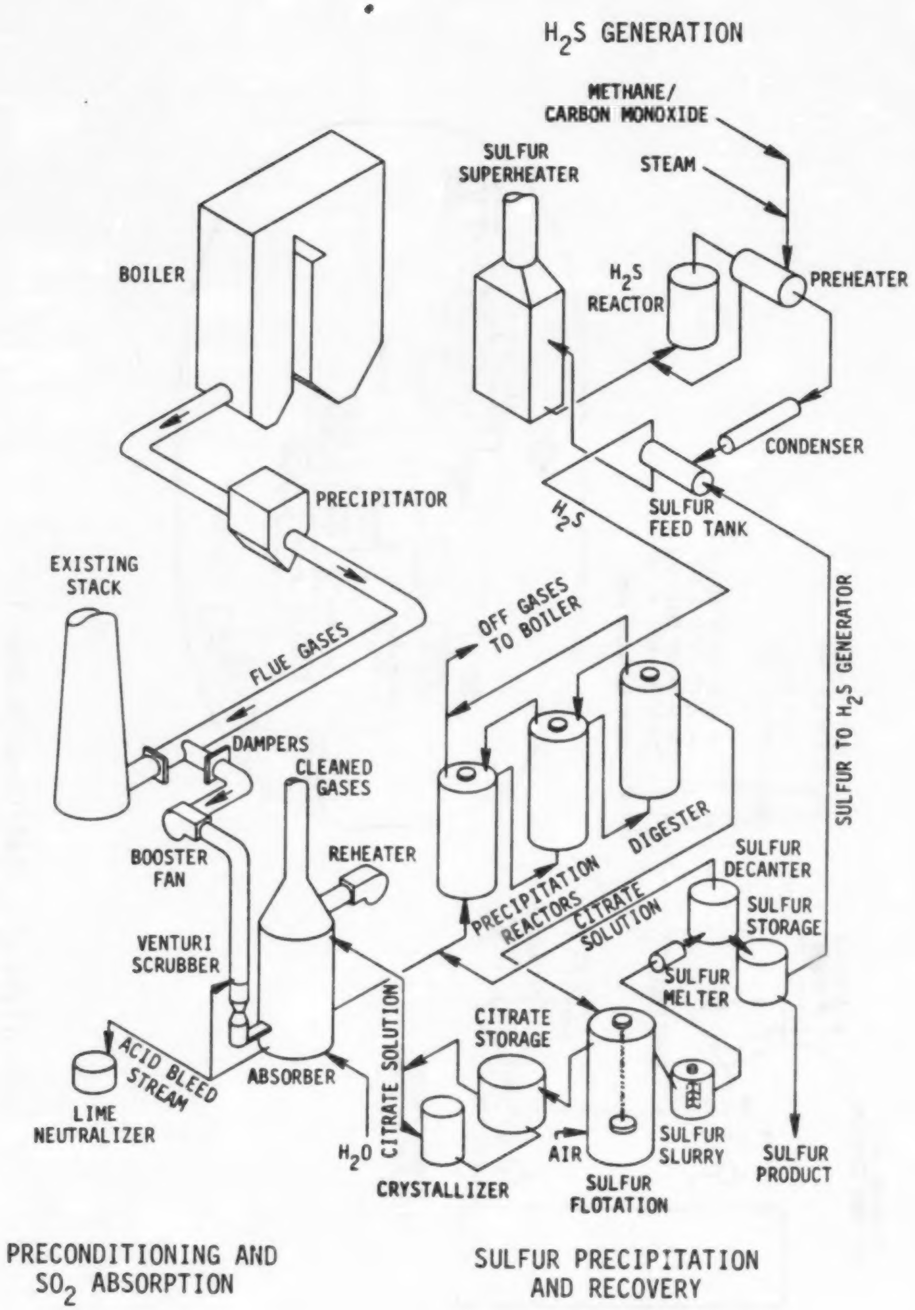
South Mississippi Electric, R.D. Morrow 1 and 2:
Simplified Process Flow Diagram


SODA ASH STORAGE
LIME STORAGE
FROM ESP
LIME
(CaO)
USE BIN
SLAKER $Ca(OH)_2$
WATER
Na_2CO_3
BY-PASS
$CaSO_3/Na_2SO_3$
THICKENER
LIME REACTOR
FILTER
SULFUR DIOXIDE ABSORPTION
$Na_2SO_3 + SO_2 + H_2O \longrightarrow 2\ NaHSO_3$
STACK
BOOSTER FAN
SURGE TANK
$CaSO_3/CaSO_4$
FILTER CAKE
SODIUM REGENERATION
$2\ NaHSO_3 + Ca(OH)_2 \longrightarrow CaSO_3 \cdot 1/2\ H_2O + Na_2SO_3 + 1\text{-}1/2\ H_2O$

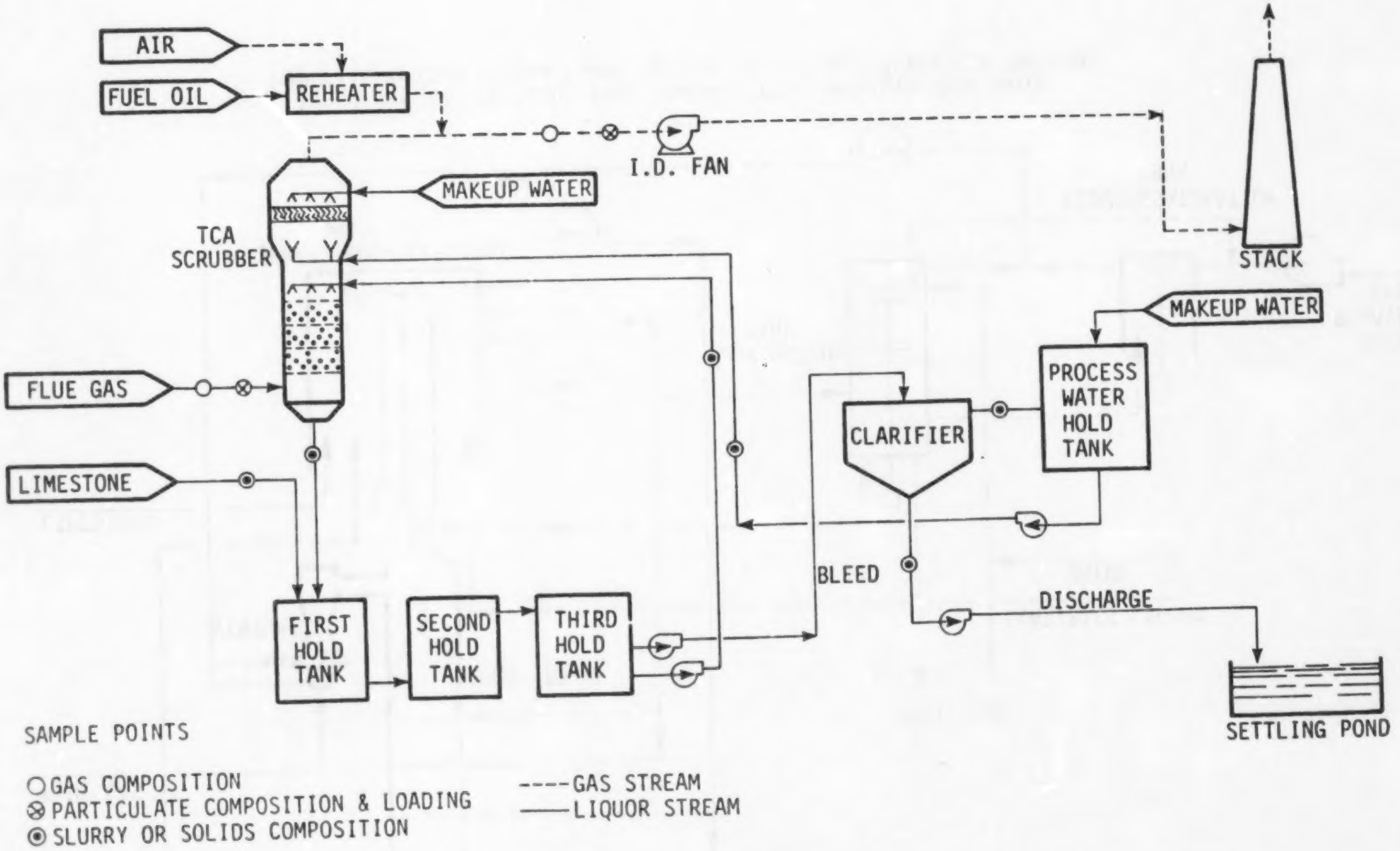
Southern Indiana Gas and Electric, A.B. Brown 1:
Dual Alkali FGD System Simplified Process Flow Diagram


SCRUBBER INLET TEST PORT LOCATION
"B" ABSORBER MODULE
TOP OF STACK ELEVATION 1645'
TEST PORT ELEVATION 1516'
"B" I.D. FAN
ESP
TOP OF OUTLET BREECHING ELEVATION 1372'-2 3/8"
TOP OF BYPASS BREECHING ELEVATION 1307'- 8 1/2"
BYPASS DUCT
AIR HEATER
GRADE ELEVATION 1261'
PRECIPITATOR INLET TEST PORT LOCATION
"A" ABSORBER MODULE
"A" I.D. FAN
SCRUBBER INLET TEST PORT LOCATION
FROM DRAW-OFF SUMP
THICKENER
VACUUM FILTER
FILTER CAKE (MIXED WITH FLYASH FOR LANDFILL DISPOSAL)
MAKEUP WATER
SUPERNATANT TANK
DEMISTER WASH TANK
DEMISTER
PRESATURATOR TANK
LIMESTONE
ABSORBER LAYERS
SLURRY MAKEUP
LIMESTONE PREPARATION EQUIPMENT
PRESATURATOR
PRESATURATOR TANK OVERFLOW
HOLDTANK OVERFLOW
HOLD TANK
RECYCLE PUMPS
DRAW-OFF SUMP
TO THICKENER

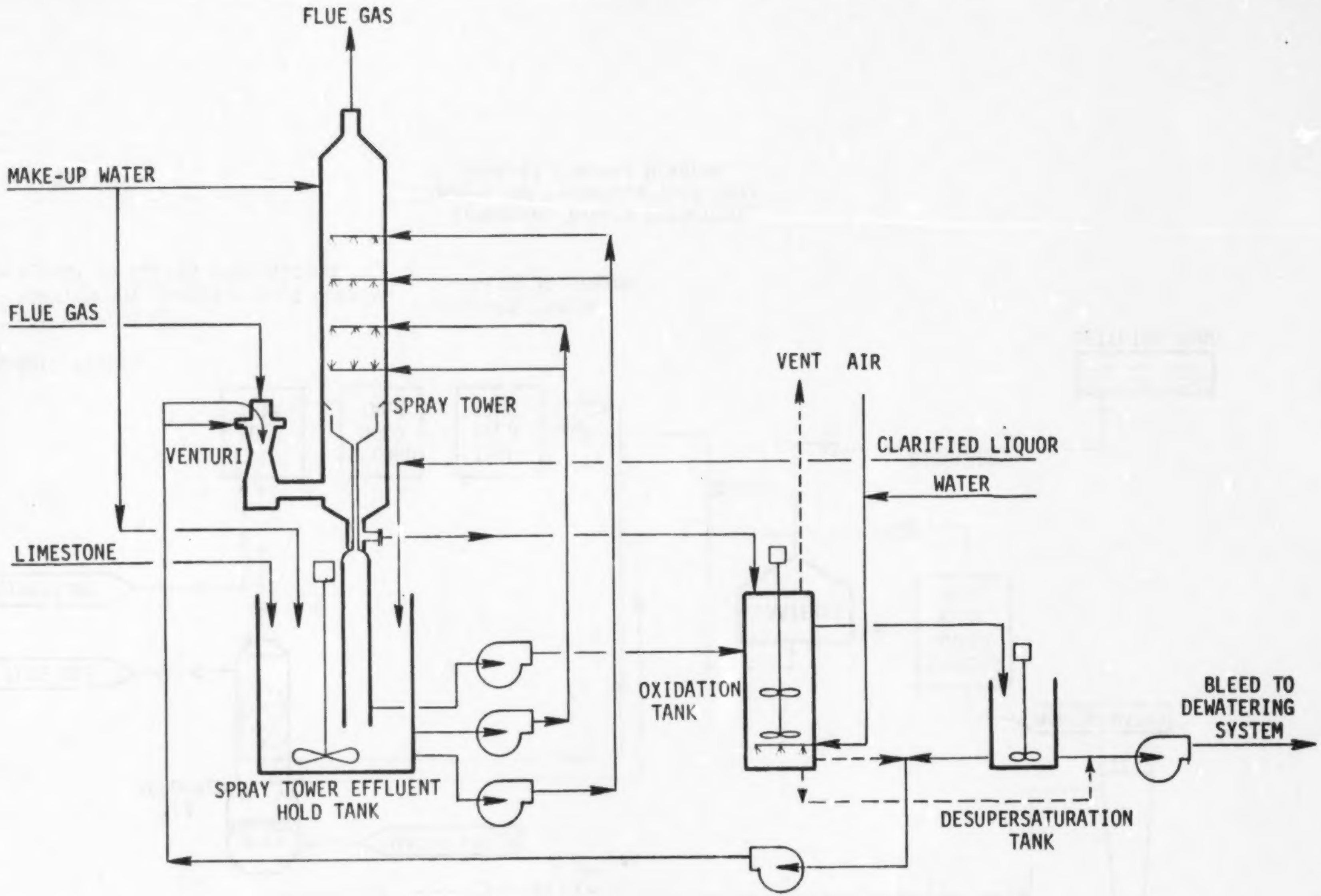
Springfield City Utilities, Southwest 1:
Simplified Process Diagram


H2S GENERATION
METHANE/ CARBON MONOXIDE
STEAM
SULFUR SUPERHEATER
BOILER
H2S REACTOR
PREHEATER
CONDENSER
PRECIPITATOR
H2S
SULFUR FEED TANK
EXISTING STACK
OFF GASES TO BOILER
SULFUR TO H2S GENERATOR
FLUE GASES
DAMPERS
CLEANED GASES
BOOSTER FAN
REHEATER
DIGESTER
PRECIPITATION REACTORS
CITRATE SOLUTION
SULFUR DECANTER
SULFUR STORAGE
VENTURI SCRUBBER
SULFUR MELTER
CITRATE STORAGE
CITRATE SOLUTION
ACID BLEED STREAM
ABSORBER
LIME NEUTRALIZER
H2O
AIR
SULFUR SLURRY
SULFUR PRODUCT
CRYSTALLIZER
SULFUR FLOTATION
PRECONDITIONING AND SO2 ABSORPTION
SULFUR PRECIPITATION AND RECOVERY

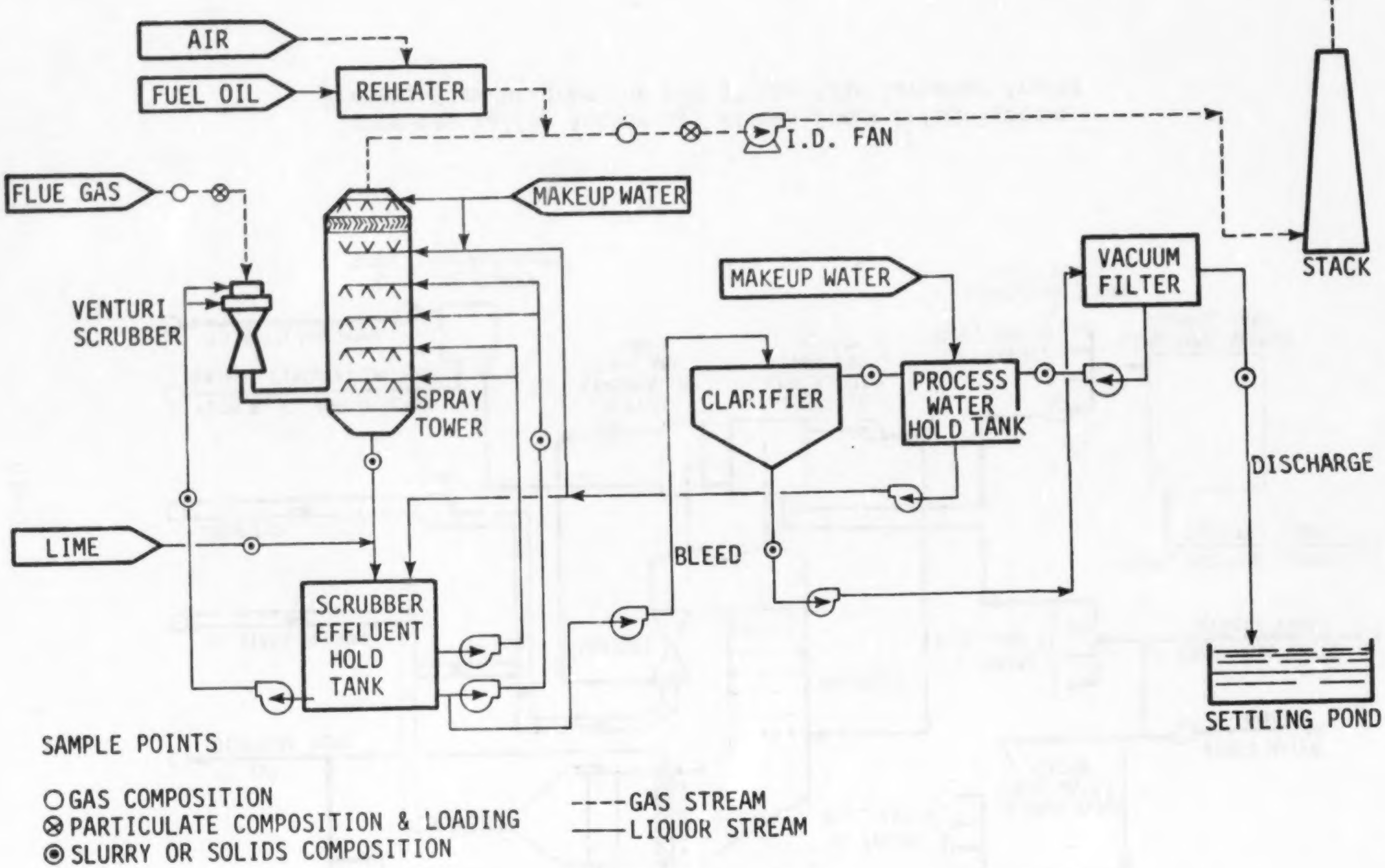
St. Joe Zinc, G.F. Weaton 1:
Citrate FGD System Simplified Process Flow Diagram


AIR
FUEL OIL
REHEATER
I.D. FAN
STACK
MAKEUP WATER
TCA SCRUBBER
FLUE GAS
LIMESTONE
FIRST HOLD TANK
SECOND HOLD TANK
THIRD HOLD TANK
BLEED
CLARIFIER
MAKEUP WATER
PROCESS WATER HOLD TANK
DISCHARGE
SETTLING POND
SAMPLE POINTS
○ GAS COMPOSITION
⊗ PARTICULATE COMPOSITION & LOADING
⊙ SLURRY OR SOLIDS COMPOSITION
----GAS STREAM
——LIQUOR STREAM

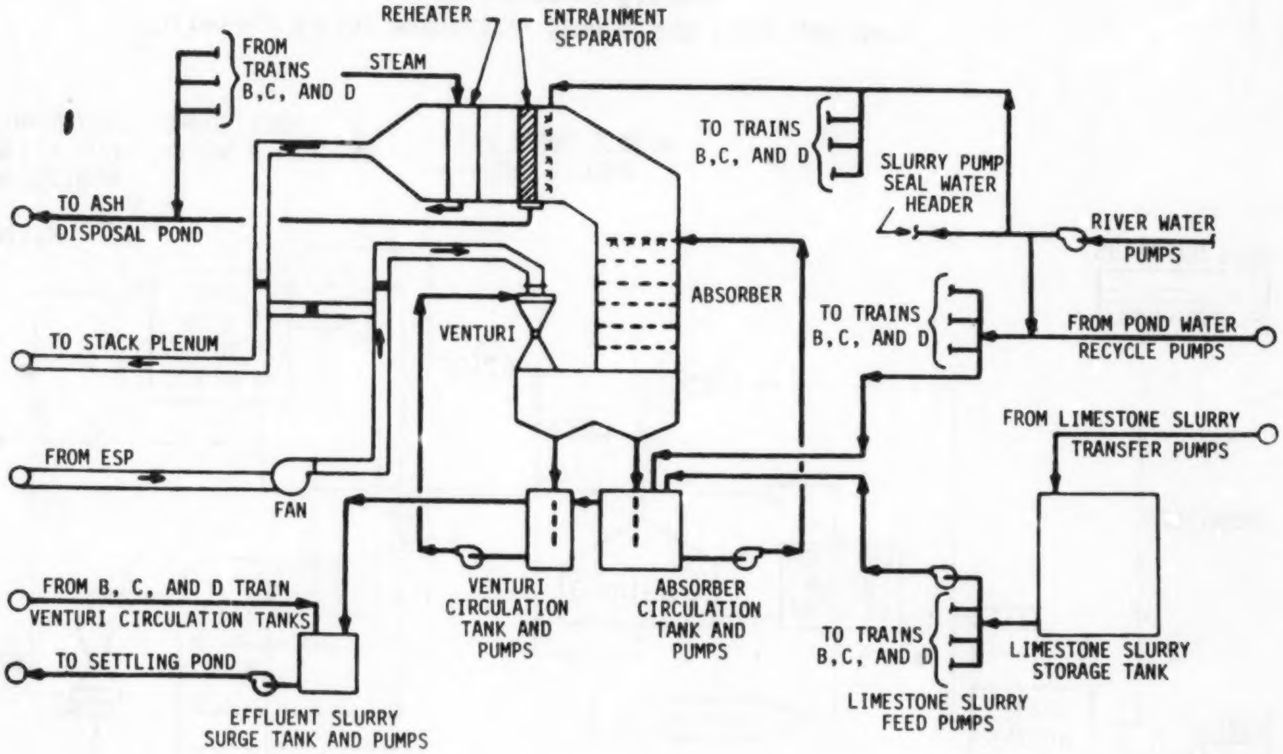
Tennessee Valley Authority,
Shawnee 10A Prototype Test Unit:
General Process Diagram.


FLUE GAS
MAKE-UP WATER
FLUE GAS
SPRAY TOWER
VENTURI
LIMESTONE
SPRAY TOWER EFFLUENT
HOLD TANK
VENT
AIR
CLARIFIED LIQUOR
WATER
OXIDATION
TANK
DESUPERSATURATION
TANK
BLEED TO
DEWATERING
SYSTEM

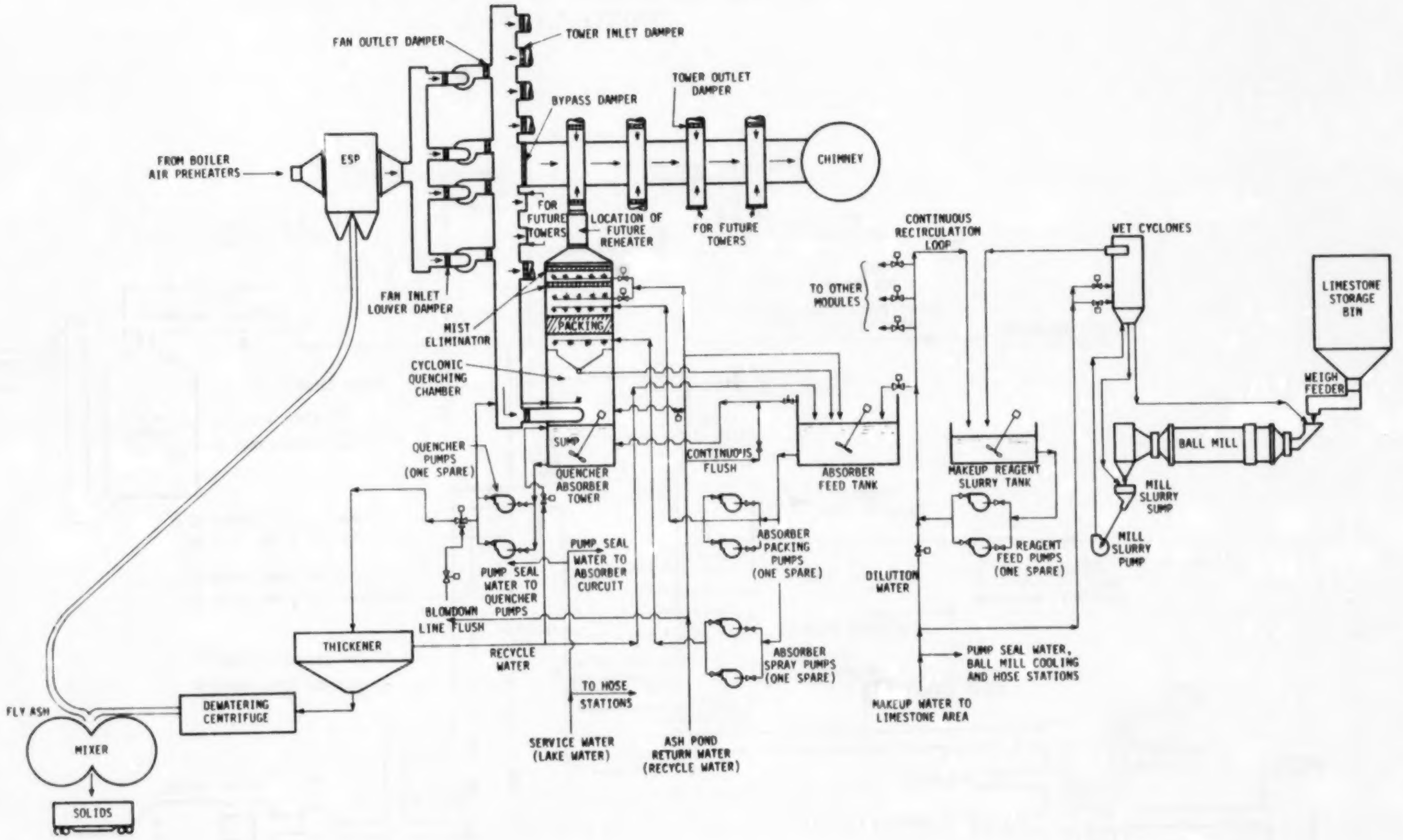
Tennessee Valley Authority, Shawnee 10B Prototype Test Unit:
Modified Venturi/Spray Tower System for 2-Stage Oxidation Testing.


AIR
FUEL OIL
REHEATER
I.D. FAN
STACK
FLUE GAS
MAKEUP WATER
VENTURI SCRUBBER
SPRAY TOWER
MAKEUP WATER
VACUUM FILTER
CLARIFIER
PROCESS WATER HOLD TANK
DISCHARGE
LIME
BLEED
SCRUBBER EFFLUENT HOLD TANK
SETTLING POND
SAMPLE POINTS
○ GAS COMPOSITION
⊗ PARTICULATE COMPOSITION & LOADING
⊙ SLURRY OR SOLIDS COMPOSITION
----GAS STREAM
——LIQUOR STREAM

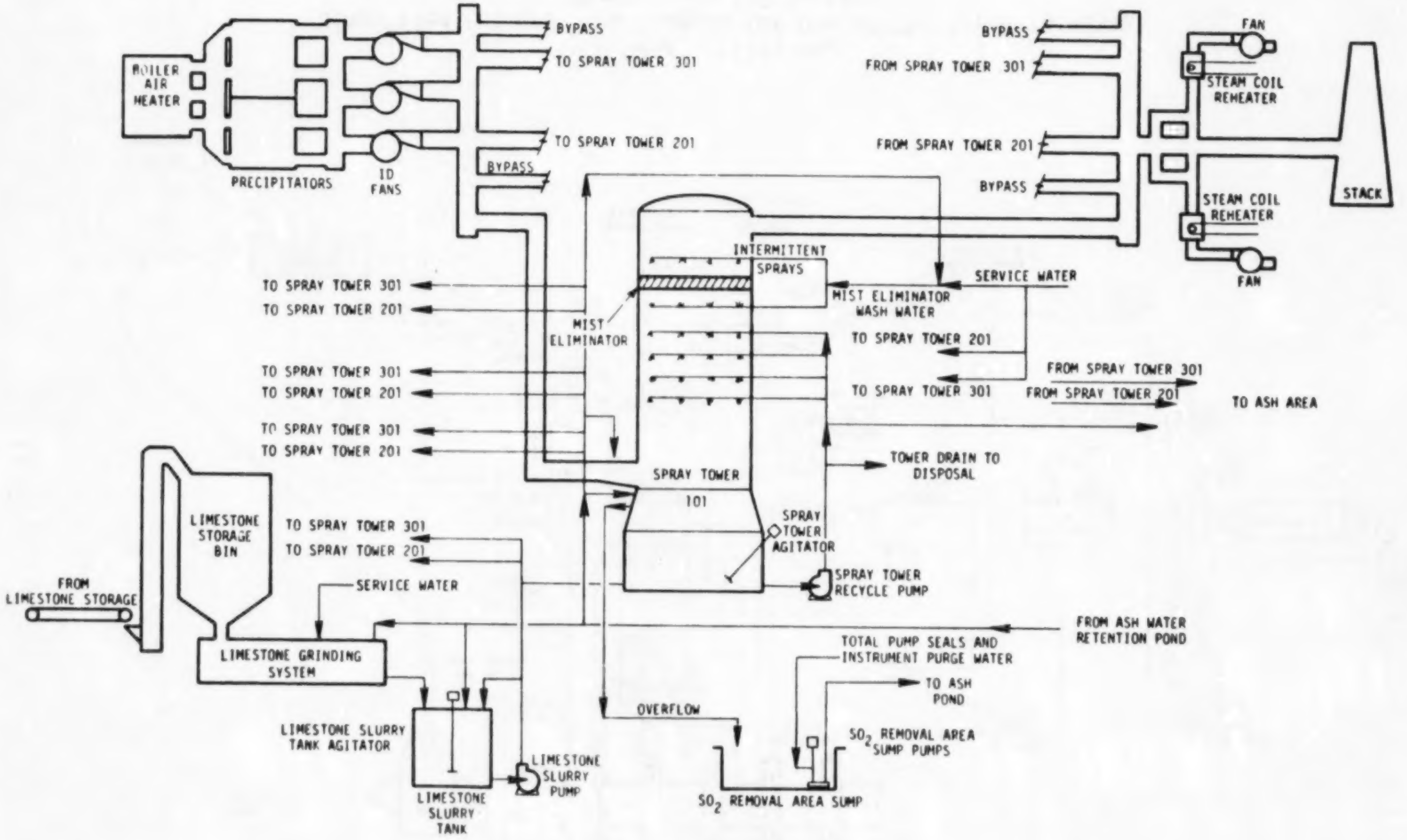
Tennessee Valley Authority, Shawnee 10B Prototype Unit: General Process Diagram.


REHEATER
ENTRAINMENT SEPARATOR
FROM TRAINS B,C, AND D
STEAM
TO ASH DISPOSAL POND
TO STACK PLENUM
FROM ESP
FAN
VENTURI
ABSORBER
TO TRAINS B,C, AND D
SLURRY PUMP SEAL WATER HEADER
RIVER WATER PUMPS
TO TRAINS B,C, AND D
FROM POND WATER RECYCLE PUMPS
FROM LIMESTONE SLURRY TRANSFER PUMPS
FROM B, C, AND D TRAIN VENTURI CIRCULATION TANKS
TO SETTLING POND
EFFLUENT SLURRY SURGE TANK AND PUMPS
VENTURI CIRCULATION TANK AND PUMPS
ABSORBER CIRCULATION TANK AND PUMPS
TO TRAINS B,C, AND D
LIMESTONE SLURRY FEED PUMPS
LIMESTONE SLURRY STORAGE TANK

Tennessee Valley Authority, Widows Creek 8 FGD System:
Process Flow Diagram for One of the Four Scrubber Trains


FAN OUTLET DAMPER
TOWER INLET DAMPER
BYPASS DAMPER
TOWER OUTLET DAMPER
FROM BOILER AIR PREHEATERS
ESP
CHIMNEY
FOR FUTURE TOWERS
LOCATION OF FUTURE REHEATER
FOR FUTURE TOWERS
CONTINUOUS RECIRCULATION LOOP
WET CYCLONES
LIMESTONE STORAGE BIN
FAN INLET LOUVER DAMPER
TO OTHER MODULES
MIST ELIMINATOR
PACKING
CYCLONIC QUENCHING CHAMBER
WEIGH FEEDER
BALL MILL
QUENCHER PUMPS (ONE SPARE)
SUMP
QUENCHER ABSORBER TOWER
CONTINUOUS FLUSH
ABSORBER FEED TANK
MAKEUP REAGENT SLURRY TANK
MILL SLURRY SUMP
MILL SLURRY PUMP
PUMP SEAL WATER TO ABSORBER CURCUIT
ABSORBER PACKING PUMPS (ONE SPARE)
REAGENT FEED PUMPS (ONE SPARE)
DILUTION WATER
PUMP SEAL WATER TO QUENCHER PUMPS
BLOWDOWN LINE FLUSH
THICKENER
RECYCLE WATER
ABSORBER SPRAY PUMPS (ONE SPARE)
PUMP SEAL WATER, BALL MILL COOLING AND HOSE STATIONS
TO HOSE STATIONS
MAKEUP WATER TO LIMESTONE AREA
FLY ASH
DEWATERING CENTRIFUGE
MIXER
SERVICE WATER (LAKE WATER)
ASH POND RETURN WATER (RECYCLE WATER)
SOLIDS

Texas Utilities,
Simplified Process Flow Diagram for One of the Three Identical
Martin Lake FGD Systems


BOILER AIR HEATER
PRECIPITATORS
ID FANS
BYPASS
TO SPRAY TOWER 301
TO SPRAY TOWER 201
BYPASS
BYPASS
FROM SPRAY TOWER 301
FROM SPRAY TOWER 201
BYPASS
FAN
STEAM COIL REHEATER
STACK
STEAM COIL REHEATER
FAN
INTERMITTENT SPRAYS
SERVICE WATER
MIST ELIMINATOR WASH WATER
MIST ELIMINATOR
TO SPRAY TOWER 301
TO SPRAY TOWER 201
TO SPRAY TOWER 201
TO SPRAY TOWER 301
TO SPRAY TOWER 201
FROM SPRAY TOWER 301
FROM SPRAY TOWER 201
TO SPRAY TOWER 301
TO ASH AREA
TO SPRAY TOWER 301
TO SPRAY TOWER 201
TOWER DRAIN TO DISPOSAL
SPRAY TOWER 101
LIMESTONE STORAGE BIN
TO SPRAY TOWER 301
TO SPRAY TOWER 201
SPRAY TOWER AGITATOR
SERVICE WATER
SPRAY TOWER RECYCLE PUMP
FROM LIMESTONE STORAGE
FROM ASH WATER RETENTION POND
LIMESTONE GRINDING SYSTEM
TOTAL PUMP SEALS AND INSTRUMENT PURGE WATER
TO ASH POND
OVERFLOW
LIMESTONE SLURRY TANK AGITATOR
SO_2 REMOVAL AREA SUMP PUMPS
LIMESTONE SLURRY PUMP
SO_2 REMOVAL AREA SUMP
LIMESTONE SLURRY TANK

Texas Utilities,
Simplified Process Flow Diagram for Monticello 3